ISOVER
SAINT-GOBAIN

TEHTY SUOMESSA
MADE IN FINLAND

ISOVER Facade

System Manual

10/2021

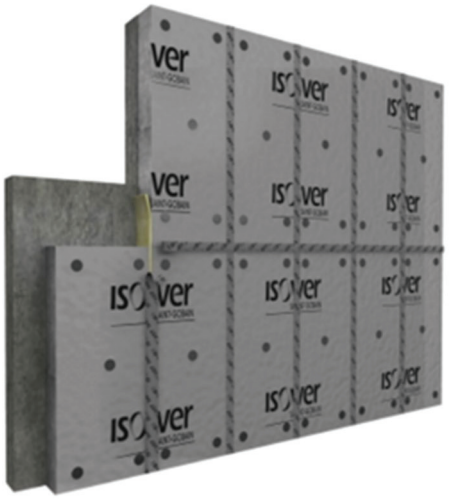
isover.fi

SAINT-GOBAIN

Contents

The construction types and details presented in this system manual and its Appendices (1 and 2) are examples to facilitate the selection of structures and to support good design and execution of construction. However, decisions concerning the construction types and details of each construction site must be made, taking into account the specific characteristics and needs of the construction site. ISOVER is therefore not responsible for the choice of construction types and details made on individual construction sites. The choice of structures and their suitability for the application in hand is always the responsibility of the designer.

ISOVER Facade System Manual, October 2021



1. What is the ISOVER Facade system?

The ISOVER Facade system covers wind protection-coated thermal insulation slabs developed for demanding moisture conditions, mounting and sealing accessories for the slabs, and a system manual with details (Appendix 2). The features and performance of the Facade products have been experimentally verified, and they are described in this system manual.

The ISOVER Facade thermal insulation slab is a non-combustible product of the A2-s1, d0 class that efficiently transmits water vapour and is windproof and waterproof against rainwater. ISOVER Facade is made of inorganic material, so it is not a suitable culture medium for various microbes (such as mould fungi). The Facade coating is moisture-repellent (hygrophobic) and the product also does not store moisture in itself (non-hygroscopic), but allows moisture to escape out of the structure. The thermal insulation capacity of the Facade products is the most efficient on the mineral wool market - thermal conductivity λ_D is only 0.031 W/m^{2}K. As a mineral wool insulation, the product also effectively insulates sound and provides the structure with tested fire protection. The ISOVER Facade thermal insulation slabs also have an emission classification of M1 for building materials.

Thanks to its properties, the Facade system is suitable for wind protection and thermal insulation of wood, stone and steel structures. In addition to newbuilding, the system is also ideal as an additional external thermal insulation solution for old structures (Appendix 2: renovation). The Facade system acts as a weather protection on the exterior wall even during construction (max. 6 months), as the properties of the Facade slab (air-tightness, water vapour permeability, water-tightness) have been shown to remain at the level required for the product in UV and weathering tests corresponding to a six month period in Finnish outdoor conditions. In addition, the properties of the ISOVER Facade tape and sealant included in the system have been tested in a nine-month UV and weathering test corresponding to outdoor conditions. The 6-month weathering guarantee for Facade slabs requires that the Facade slabs are properly stored in their packaging, are fastened, slab joints sealed, and open slab edges sealed with system products in accordance with this System Manual and installation instructions. See Appendix 2: Fastening and sealing instructions.

2. Thermal insulating wind protection for exterior wall structures in demanding conditions

The purpose of the System Manual is to facilitate the design and implementation of newbuild and renovation structures. The properties of the ISOVER Facade thermal insulation slabs correspond directly to the current and forecast future climate conditions in the Nordic countries in particular.

According to the Finnish Meteorological Institute›s bulletin “New climate change forecasts for Finland published” (https://www.ilmatieteenlaitos.fi/tiedote/286502114, 19.12.2016) the climate in Finland is forecast to become warmer and wetter during this century - with both changes occurring most dramatically in winter However, the bulletin also states that the new models also predict that the summers will warm up somewhat more strongly than previously predicted, and that rainfall is likely to increase in all seasons, with the highest percentage in winter.

If realised, these predicted climate changes would shorten e.g. periods allowing external wall structures to dry if dry spells and dry weather conditions decrease as rainfall increases and winter temperatures rise. The possible warming of the summer season, in turn, is likely to increase cooling of living quarters, which may reduce the structures’ chances of drying during a period that is otherwise favourable for drying.

The Ministry of the Environment›s guideline “Moisture performance of buildings” states that *”The effects of climate change are predicted to entail wet autumn and winter periods as well as extreme weather phenomena. In a changing climate, the importance of the drying capacity of structures is emphasised. This has been taken into account by directing construction in a more fault-tolerant direction. Structural fault tolerance refers to solutions in which the slightest defects and deficiencies in the design, construction, maintenance and operation of buildings do not yet lead to harmful damage to the structures. The guidelines emphasise the importance of taking into account the weather phenomena caused by the changing climate through sufficiently detailed design, as well as model work, work phase inspections and quality assurance to be defined during the design phase and carried out*

during the implementation phase." (The Ministry of the Environment›s guideline on moisture performance of buildings, 2020).

In the future, more moisture resistance, rain and wind resistance and efficient drying capacity will be required for the exterior parts of the exterior wall structure. The air gap between the cladding and wind protection must be effectively ventilated, ensuring that both the cladding and the moisture leaving the structure to dry out. The interior parts, in turn, are required to have good airtightness and a sufficiently high water-vapour resistance.

Article 24 of Decree 782/2017 of the Ministry of the Environment states that *"The outer wall and its various layers must form a whole which prevents the harmful passage of water into the structures. The water-vapour resistance and airtightness of the external wall and its various layers, as well as the structures connected to the external wall and the external wall joints, shall be such that the moisture content of the wall due to diffusion or convection of indoor air water vapour does not adversely affect the moisture performance of the structure. If an air or vapour barrier is used in the structure, the joints, edges and penetrations must be tight.* (The Ministry of the Environment›s guideline on moisture performance of buildings).

The water-vapour resistance of traditional LDPE vapour-barrier films ("vapour barrier plastic") is high (relative diffusion resistance s_d 20-100 m) and practically it does not change at an internal temperature of 23 °C as the relative humidity varies. The RIL 107-2012 guide (Guidelines for waterproofing and moisture insulation of buildings) presents the minimum value of the water vapour resistance of a vapour barrier s_d 20 m (in conditions T=23 °C and RH=50 %) for humidity class 1 buildings. In buildings of humidity class 2-3, the water-vapour resistance may be lower under the conditions set out in RIL 107-2012.

In an exterior wall structure insulated with open-cell thermal insulation, the vapour barrier plastic installed on the inner surface, when properly installed, really effectively limits the transfer of indoor air moisture to the outer wall structure. In a properly constructed structure, the small amount of moisture that penetrates the vapour barrier can escape from the structure, as the water vapour resistance of the structure must decrease from the inside out. Additional protection to the inner surface of a structure can be obtained by using a so-called hygroscopic film instead of a vapour-barrier film whose water-vapour resistance decreases with increasing humidity. This also allows the structure to dry inwards under conditions where moisture would tend to rise or even condense on the outer surface of a conventional vapour-barrier film. Such conditions could exist, for example, if there is hot and humid air outside and the interior is very cool. ISOVER Vario® Xtra is a so-called moisture balancing "smart" vapour barrier with a relative diffusion resistance s_d measured to decrease from 25 m to> 0.3 m as relative humidity increases at the temperature 23 °C.. ISOVER Vario® Xtra alone is not suitable for sauna and bathroom vapour barrier solutions. The designer must always check that the structural solution meets the requirements of the application and that the product components of the structure work together as a whole, meeting the requirements set for the structure.

In addition to the smart vapour-barrier film, the ISOVER Vario system covers sealing and jointing tapes and bushings that are important for airtightness. Joints, seams and penetrations must be carefully sealed, as every small leak will cause a local but relative to the diffusion-transferred moisture, significant moisture stress on the structureIn addition, airtight implementation prevents air leaks and a feeling of cold and draft they cause, and enables controlled ventilation. According to RIL 107-2012, the recommended value of the airtightness of a building for the airtightness of the entire building›s envelope is 1.0 $m^3/(m^2h)$. This requires careful design and implementation of seals for structural joints, bushings, and window and door frame joints. The airtightness of a building›s cladding can be demonstrated by its airtightness measurement. In connection with the measurement, possible leakages can be determined.

Traditional wooden structure: interior cladding - vapour barrier - balloon frame & mineral wool - wind protection - ventilated exterior cladding is physically recommended to be implemented so that part of the thermal insulation of the structure is outside the frame as a uniform insulating layer, acting as wind protection for the structure. In a structure like this, the temperature on the external surface of the timber frame is higher and the relative

humidity lower than in case the wind protection were not heat insulating. A prerequisite for the functioning of the structure is that the external insulation is very permeable to water vapour.

It is more efficient and safe to implement a solid wood structure (CLT / LVL) entirely with external, if possible, uniform thermal insulation, the external surface of which also acts as high-quality wind protection. A uniform wind protection insulation layer that is as windproof as possible, but permeable to water vapour, guarantees both the best possible weather protection for the structure and the most effective thermal insulation. Inside the thermal insulation, a sufficiently thick wooden board acts as a vapour and air barrier for the structure, if the seams and joints are carefully sealed.

An exterior wall structure with Facade wind protection insulation works like a seamed sports textile. The Facade surface protects from rain and wind, but being permeable to water vapour, it allows any internal moisture to dry out.

Mineral wool insulates and keeps the conditions pleasant. The joints are taped tightly and the structure can be implemented without heat bridges that significantly reduce thermal insulation of the wind protection insulation layer, as the effect of the fasteners required on the facade on thermal insulation is usually small.

Each structural solution must always be designed for each particular application, and the moisture performance of the structure is ensured by the site designer, determining the thermal insulation performance of the structure and taking into account the water vapour resistance of the internal and external surfaces, so that the structure functions properly in all current and future service conditions. In addition, the designer must ensure the airtight feasibility of structural joints, connections and penetrations in his/her solutions.

Thermal insulation incl. the wind protection insulation slabs must be installed tightly against each other with tongue-and-groove/butt joints. The insulation must also be tightly against the background structure. Air gaps or cracks must not be left between the insulation layers, as they significantly impair the insulation of the structure, allowing cold air to pass past the insulation layer to the inner surface of the structure. An air gap in the insulation layer also causes a potential risk of condensation on the inner surface of the structure. Similarly, window and door junctions, the external wall junction to the foundation and e.g. the joints of any external envelope elements must be insulated with insulation that allows installation tolerances. ISOVER KH and SKC are silicone-treated and water-repellent mineral wool sealing products for the insulation of joint surfaces. The ISOVER KH mineral wool mat also acts as a levelling layer, for example between a concrete element and a wooden element to be installed on its external surface, or between old and new structures to level out irregularities.

The edges and seams of the Facade slabs must be closed either against the adjoining structure or taped with joint and sealing tapes compliant with the Facade system. In window and door openings as well as in corner joints, the edges of Facade slabs are taped with Facade system tapes or coated with ISOVER SealStripe tape. System brackets are used as fasteners for the slabs, depending on the backing material and the exterior cladding.

3. Carbon footprint of the ISOVER products

With regard to emissions from energy consumption in buildings, there is a rapid trend towards carbon-neutral use of energy. Reducing the carbon footprint of construction is a huge challenge for the entire construction sector. Emissions from the manufacture, transport, construction and demolition of building materials are included in the carbon footprint. Manufacturers of construction products play a key role in reducing carbon sequestration in buildings. By reducing the environmental impact of product life cycles and investing in product development, energy efficiency and renewable energy, the construction product industry is able to produce more environmentally friendly, low-carbon materials and products.

Behind the small carbon footprint of ISOVER glass wool insulation materials is a level of thermal insulation that can be achieved with a lower mass / amount of glass wool, and the origin of the material: glass wool is made from recycled glass, which finds its way to insulation from recycled glass in Finland. In addition, ISOVER glass wool is manufactured using renewable electricity, which reduces CO2 emissions by up to 20%. Biogas is also used in production at ISOVER›s Forssa (Finland) plant.

Naturally, insulation itself also contributes to a lower-carbon future. Insulation reduces CO2 emissions by reducing emissions from heating and cooling buildings by up to 40%.

For building materials, third-party verified product-specific Environmental Product Declarations (EPD), play a key role in promoting low-carbon construction, providing transparent, reliable and comparable information on the product›s environmental impact throughout its life cycle. In practice, EPDs tell us how much carbon dioxide is generated in the manufacture, transport and end-of-life process of products and how much is absorbed through buildings.

As we know, individual EPDs cannot be directly compared. The comparison should take into account the functional requirements and performance of the products in the application and building in question. At its simplest, information on materials is collected in connection with quantity calculations, and life cycle impacts are calculated through it. Various life cycle assessment and calculation tools are also commonly used, as the most commonly used of them we should mention the One Click LCA tool developed by the Finnish company Bionova

Manufacturers of construction products have the opportunity to share more complete and easier-to-use information on the carbon footprint of their materials and products directly into the calculation tools. At the same time, reliable comparative information on the environmental impact of different materials at the building level can be produced - also for the decision-makers who utilise the information.

Saint-Gobain will continue to work intensively for a carbon-neutral built environment promoting circular economy and well-being. It should also be considered that carbon emissions from building materials are only one criterion in assessing their liability and sustainability. On account of low-carbon we should not compromise other environmental impacts, resource efficiency, circular economy, local value creation and, most importantly, human health and the safety of buildings.

4. Environmental impact of the ISOVER Facade external wall structures

The environmental friendliness and cost-effectiveness of structures implemented using ISOVER thermal insulation materials are the result of their superior product properties, and the manufacturing and packaging methods. The product properties of the ISOVER thermal insulation materials, which can reduce the overall thickness, carbon footprint and cost of structures, are based on the lightness of glass wool and the low lambda value of the products, as well as on the good fireproofing class and sound insulation properties characteristic of mineral wool. Recycled glass is used in the manufacture of glass wool as well as renewable electricity among other things. The MultiPack packaging method of the lightweight ISOVER thermal insulation materials saves considerably transport and storage space, which clearly reduces logistics costs and the burden on the environment and the climate.

Table 1 shows the GWP values describing the climate impact of typical ISOVER Facade exterior wall structures and the U values describing thermal insulation capacity. For comparison, the table also shows the GWP and U values of structures insulated with rock wool and phenol insulation materials. The GWP values have been calculated for external wall structures implemented on site, all of which have a similar double-plastered 85 mm KAHI Facade (coatings and bricks are included in the calculations). The fire rating of the facade is A1, and it is considered to form at least an EI30 compartmentability on the outer surface of the ventilation gap. The reference value guiding the design of the heat transfer coefficient of new structures is U ≤ 0.17 W/m2K. The lower the GWP value of the structure, the lower the climate impact of the structure.

The carbon emissions have been calculated using the One Click LCA tool, according to the EU Level(s) method. Data from the Environmental Product Declarations have been prioritised in the calculation (if available at the time of calculation in July 2021), typical Finnish default values for OneClick LCA have been used, for example, for transport load levels. The data in the CO2data.fi generic emissions database have been used in the calculation, if more detailed information for Finland is not available. The results are presented as 50-years life cycle carbon emissions in $kgCO2e/m^2$.

The following life cycle steps have been considered in the carbon emissions studies in Table 1:

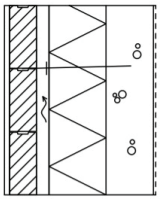
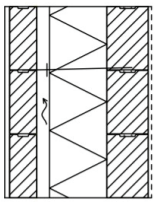
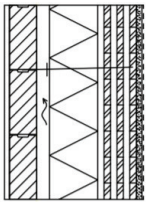
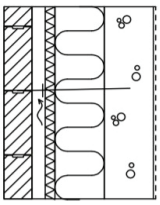
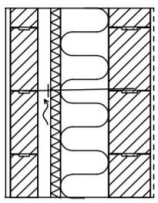
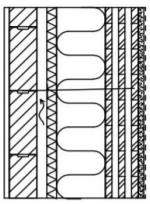
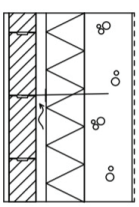
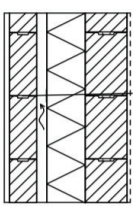
- A1-3: sourcing of product raw material + transport to factory + product manufacturing
- A4: transport from factory to site
- A5: on-site losses
- C1-4: final disposal of the product, i.e. dismantling + transport + disposal

The calculations do not take into account fasteners for interior plasterslabs, levelling compounds and paints for interior surfaces, or thermal insulation seals such as joint foam and tapes. It is considered that the timber has been taken from a managed/renewable forest.

Efforts have been made to select the insulation products in such a way that the structures to be compared meet the same level of requirements for thermal insulation and fire performance as far as possible.

The reference structures take into account what is mentioned in section 25 of Decree 848/2017 of the Ministry of the Environment on the fire safety of buildings: *"For a building with a fire rating P2 and having more than 2 floors and a height of more than 56 metres, the thermal insulation and other filling must be at least of class A2-s1, d0. In a building up to 56 metres tall and with a fire rating P1, thermal insulation may be used which meets the requirements of class B-s1, d0 for its insulating part, or the thermal insulation is protected and located so that spreading of fire to the insulation is limited to a time, which, inside the building and with respect to the opening reveals, is at least half of the fire resistance requirement for the structural components compartmenting the space."*

More GWP values for ISOVER structures can be found e.g. in the structure selector on the ISOVER website.

TABLE 1 GWP VALUES (kgCoe/m²) AND U VALUES (W/m²K) OF REFERENCE STRUCTURES						
Building's fire rating and height	P1 (over 28 and max. 56 m)				P2 (over 2 floors and max. 28 m)	
Structural frame	Prefabricated concrete element 150 mm		KAHI block 130 mm		CLT 120 mm + GFL 18	
Insulation and wind protection solution: Mineral wool, 1 layer (A2-s1,d0, λ_D 0.033 W/mK) Semi-rigid wind protection slab Fireproofing class ≥ K2 10						
ISOVER OL-33 Facade 150 mm	-		-		U = 0.17	GWP = 44.25
ISOVER OL-33 Facade 180 mm	U = 0.17	GWP = 83.46	U = 0.17	GWP = 62.59	U = 0.15	GWP = 45.13
Rock wool TS insulation slab 150 mm	-		-		U = 0.17	GWP = 47.41
Rock wool TS insulation slab 180 mm	U = 0.17	GWP = 87.60	U = 0.17	GWP = 66.74	U = 0.15	GWP = 49.27
Building's fire rating and height	P1 (over 28 and max. 56 m)				P2 (over 2 floors and max. 28 m)	
Structural frame	Prefabricated concrete element 150 mm		KAHI block 130 mm		CLT 120 mm + GFL 18	
Insulation and wind protection solution: Mineral wool, 2 layers Rigid wind protection insulation (A2-s1,d0) + Soft insulation slab (A1, λ_D 0.033 W/mK) Fireproofing class to be checked separately!						
ISOVER Facade (λ_D 0.031 W/mK) 30 mm PREMIUM 33150 mm	U = 0.17	GWP = 82.54	U = 0.17	GWP = 61.68	U = 0.14	GWP = 44.22
ISOVER Facade (λ_D 0.031 W/mK) 50 mm PREMIUM 33150 mm	U = 0.15	GWP = 83.22	U = 0.15	GWP = 62.36	U = 0.13	GWP = 44.88
Rock wool TS insulation slab (λ_D 0.032 W/mK) 30 mm Soft rock wool insulation 150 mm	U = 0.17	GWP = 88.33	U = 0.17	GWP = 67.47	U = 0.15	GWP = 50.00
Rock wool TS insulation slab (λ_D 0.033 W/mK) 50 mm Soft rock wool insulation 150 mm	U = 0.15	GWP = 89.58	U = 0.15	GWP = 68.7	U = 0.13	GWP = 51.25
Building's fire rating and height	P1 (over 28 and max. 56 m)				P2 (over 2 floors and max. 28 m)	
Structural frame	Prefabricated concrete element 150 mm		KAHI block 130 mm		CLT 120 mm + GFL 18	
Insulation and wind protection solution: Phenolic insulation* Coating B-s1,d0, core C-s1,d0 Thermal conductivity λ_D 0.020 W/mK						
Phenolic insulation, thickness 120 mm	U = 0.16	GWP = 90.01	U = 0.16	GWP = 69.15	-	

The surface structures of the external surface must protect the insulation from fire so that the protection corresponds to an EI 30 rating building component.

GFL 18 = A2-s1,d0 / K2 30. CLT = D-s2,d0. Concrete & KAHI brick = A1

The effect of mechanical fasteners penetrating the insulation has not been taken into account in the U-value calculations, and the correction factor for air gaps is 0.

5. Technical instructions and requirements for wind protection slabs in structures insulated with open-cell thermal insulation

RIL 107-2012: Water and moisture insulation instructions for buildings:

- The air permeability factor must not exceed 10x10-6 $m^3/(m^2sPa)$.
- Thermal resistance R_D in wooden structures is usually at least 0.4 m^2K/W, and the thermal resistance of the wind protection used in a low (maximum 10 m high) brick clad wooden outer wall must be at least 1.6 m^2K/W, if the wind protection is installed against a uniform vertical frame passing through the structure.
- The recommended maximum value for water vapour resistance is $1.0x10^9$ m^2sPa/kg* (s_d = 0.2 m), if the thermal resistance of the wind protection is less than 0.4 m^2K/W. The water vapour resistance may be higher if the wind protection is more heat-insulating or if the properties of the wind protection allow the wind protection to have a sufficiently good moisture performance and drying-out ability. However, the maximum value of the water vapour resistance is also in this case $5.0x10^9$ m^2sPa/kg* (s_d = 1.0 m).

  *) = at 23 °C and relative humidity of 75%.

In addition, the fire technical requirements set for the outer surface of the external wall structure must be taken into account (Decree 848/2017 of the Ministry of the Environment on the fire safety of buildings).

6. ISOVER Facade: properties

ISOVER Facade slabs are manufactured in thicknesses of 25, 30, 50, 75 and 100 mm. The 25 mm thick Facade is extra rigid (EJ). It can be used as a background for wood cladding without spacers. Facade slabs are tonged and grooved on the long sides. The standard dimensions for Facade slabs are 1200 x 1800/3000. The standard dimensions for the EJ slab are 1200 x 1800/3000.

ISOVER OL-33 Facade slabs are available in thicknesses of 120, 150, 180 and 205 mm. The λ_D is a bit higher than that of the thinner Facade slabs, 0.033 W/mK. Standard slab sizes are 600x1500 mm. ISOVER OL-33 Facade semi-rigid wind protection insulation. If it is used on the outer surface of a timber frame structure on the back of a wood facade, Termofix spacers must be used to support the facade battening, or alternatively the screw fastening of the battening must be made as a diagonal screw joint (according to a separate screw joint plan) with full-threaded cylinder head screws which, when attached, do not press the battening into the insulation.

Intended use	Wind protection and additional insulation of facade structures, as well as prefabricated and site-made shell structures
Coating Water vapour permeability	Water vapour permeable Facade wind protection coating Water vapour permeability factor 3·66*10E-9 kg/m²s Pa* (EN 12086).
Moisture behaviour	The product is highly permeable to water vapour and allows moisture to dry outwards from the structure. The product is non-hygroscopic and retains its thermal insulation properties regardless of humidity of air.
Air permeability	Air permeability factor ≤ 10*10E-6 m³/m²s Pa* (EN 29053).
Thermal conductivity Lambda Design value λ_D	Facade 25 – 100 mm: 0.031 W/mK OL33 Facade 120 – 205 mm: 0.033 W/mK
Watertightness	Class W2** (EN 13111 applied)
Reaction to fire	A2-s1,d0 - Euro fire rating
Maximum application temperature	For basic slab 200 °C (depending on application)
*) = Before and after approx. 6 months of climate chamber testing corresponding to outdoor conditions. *) = Before and after approx. 9 months of climate chamber testing corresponding to outdoor conditions.	

Table 2 ISOVER Facade - technical characteristics of wind protection insulation slabs.

ISOVER Facade, thickness	Thermal resistance R_D
25 mm	0.80 m²K/W
30 mm	0.95 m²K/W
50 mm	1.60 m²K/W
75 mm	2.40 m²K/W
100 mm	3.20 m²K/W
120 mm	3.60 m²K/W
150 mm	4.50 m²K/W
180 mm	5.45 m²K/W
205 mm	6.20 m²K/W

Table 3 Thermal resistance in various thicknesses

Verified by fire tests

- The combination of ISOVER Facade 50 mm and Gyproc GTS-9 wind protection slabs forms an EI 30 building element on the outer surface of the wall frame (Facade on the fire side).
- Protective cladding K2 10 is achieved with ≥ 120 mm ISOVER OL-33 Facade wind protection insulation slabs.
- REI60 * compartmentability can be achieved with a wall structure with structural layers starting from the fire load side:
  - Timber cladding ≥ 21 mm + trussed battening ≥ 2x21x70
  - ISOVER Facade ≥ 30 mm / EJ 25 mm
  - Frame ≥ 42x123 (ctrs600) + ISOVER PREMIUM 33
  - Vapour barrier and Gyproc GEK 13

  *) = 20 kN/m / 12 kN/stud

7. Water tightness of ISOVER Facade coating

The Facade coating effectively protects the structure from rainwater. A water drop is not easily absorbed into the material Figures 2 and 3 show the results of a Droplet test on the surface of the Facade coating and, for comparison, on that of a traditional wood fibre slab used for wind protection. The test pieces were in a horizontal position, which differs from their intended position. Figures 2 and 3 were taken with a microscope camera 2, 10 and 20 minutes after the water drop was dropped on the surface of the product. The test was performed using a Krüss DSA30 Droplet tester. The device drops a standard-sized water drop on the surface of the test material with a sample needle and then measures the contact angle of the drop with respect to the surface of the material, see fig. 1. The larger the angle and the less the angle decreases over time, the better the surface retains the spread of the water drop, i.e. absorption into the material.

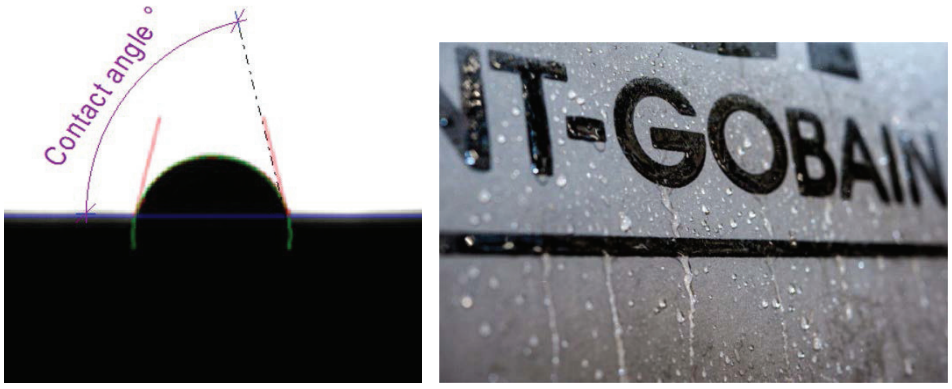


Fig. 1 The contact angle of a drop with respect to the surface.

Figure 2 shows how the contact angle of a water drop on the surface of a Facade slab changed over time: At 2 minutes the angle was 76 degrees, at 10 minutes 71.8 degrees, and at 20 minutes 64.9 degrees. In 20 minutes the angle changed about 11.1 degrees. Figure 3 shows how the contact angle of a water droplet on the surface of a wind protection slab (wood fibre slab) used for comparison changed over time: At 2 minutes the angle was 53.7 degrees, at 10 minutes 38.7 degrees, and at 20 minutes 0 degrees, the drop was no longer measurable at the end of the test.

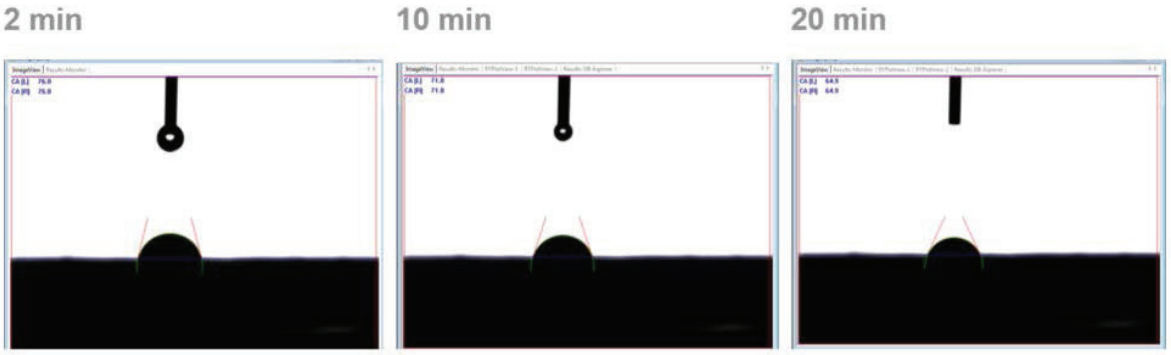


Fig. 2 A water drop dropped on Facade. Pictures at 2-10-20 minutes.

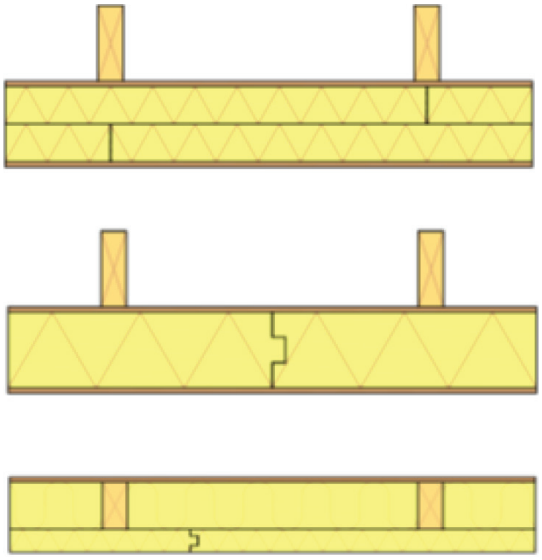
Fig. 3 A water drop dropped on a wood fibre wind protection slab Pictures at 2-10-20 minutes.

8. Effect of Facade wind protection insulation on the U value of a heat-insulated wood-framed external wall and on the temperature of the external surface of the frame structure

A uniform and effectively heat-insulating (low lambda value) wind protection sheeting mounted on the external surface of a wood-framed outer wall structure raises the temperature of the external surface of the frame structure according to the thickness of the wind protection insulation. While the temperature is higher, the relative humidity in the structure naturally becomes lower, and in the cooler seasons the conditions of the external surface of the frame structure are farther away from the dew point.

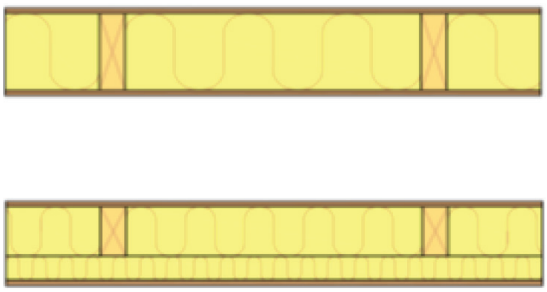
The calculated U value of the structure is also improved by the external thermal insulation implemented with the Facade system, so that the air gap correction factor ΔU_g to be taken into account in the U value calculation can be set to zero. Depending on the frame structure and insulation method, the correction level is usually 1, but the correct installation method of the Facade system corresponds to a correction level of 0, in which case the correction factor of the air gaps does not increase the U value of the structure. This directly improves the U value of the structure by about 0.01 W/m^{2}K. Figure 4 shows the consideration of the correction levels of the external wall structure in different insulation solutions, and the installation of Facade corresponds to the third highest solution of the correction level 0, where the joints of the insulation slabs outside the frame are tongue-and-groove joints and/or the joints are sealed. There must be no gaps between the insulation layers.

CORRECTION LEVEL 0



- Thermal insulation is not cut at the battening; the seams of the overlapping thermal insulation slabs are overlapped in different places; there are no air gaps at the boundaries of the thermal insulation and the structure.
- Thermal insulation is not cut at the battening; the seams of the thermal insulation slabs are rebated, tongued-and-grooved or sealed; there are no air gaps at the boundaries of the thermal insulation and the structure.
- Thermal insulation is not cut at the battening; the seams of the continuous heat insulation layer›s slabs are rebated, tongued-and-grooved or sealed; there are no air gaps at the boundaries of the thermal insulation and the structure.

CORRECTION LEVEL 1



- Thermal insulation is cut at the battening; there are no air gaps at the boundaries of the thermal insulation and the structure.
- Thermal insulation is cut at the battening; there are no air gaps at the boundaries of the thermal insulation and the structure.
  NOTE! In the structure of the picture, the vertical and horizontal battening cut the thermal insulation layers

Fig. 4 Examples of external wall structure correction levels (Puuinfo Oy, Puurakenteen_U-arvo_versio_1-03)

The external and inner surfaces of conventional non-heat insulating or poorly heat insulating wind protection slabs are at almost the same temperature, following the outside temperature - all year round. In cool and humid seasons, the relative humidity on the external surface of the frame rises and can even rise close to the dew point.

The conditions prevailing in the external wall structure can be influenced by the following things:

- Indoor temperature and humidity (heating and ventilation)
- Airtightness and water vapour resistance of the inner surface of the external wall structure, i.e. air and vapour barrier (material and correct installation). The diffusion and convection of the moisture of indoor air into the structure is minimised.
- Thermal insulation of the external wall structure (material and correct installation).
- Wind protection of the external wall structure (heat-insulating, with high water vapour permeability, rain-proof) of Facade and facade back ventilation

Figure 5 shows the heat and humidity conditions on the inner surface of a wind protection slab as determined by the DOF thermal program, i.e. at the level of the external surface of the frame at the frame insulation (= focal point *) in two external wall structures meeting today›s thermal insulation requirements U value 0.17 W/m²K). In both structures, the vapour barrier film is tightly installed between the inner surface of the frame and the inner cladding panel, and the thermal insulation filling the frame is ISOVER PREMIUM 33. The external surface of the left-hand wall structure has a poorly heat-insulating wind protection slab (R_d = 0.24 m²K/W) and the right-hand structure has a 50 mm thick ISOVER Facade slab (R_d = 1.61 m²K/W). The total thicknesses of the structures differ by 37 mm, because in the structure on the right, the timber frame section is 75 mm thinner as the Facade slab also acts as an effective thermal insulator and wind protection for the structure. The calculation parameters of the materials used for the structures in the DOF analysis are shown in Table 4.

Material properties used in the DOF analysis	**d**	**sd**	**λ_D**
	mm	m	**W/mK**
Gypsum wallboard	12.5	0.09	0.250
Vapour-barrier film PE	0.2	40.00	0.340
Air barrier paper	0.3	0.70	0.150
ISOVER insulation	125.0	0.13	0.033
	150.0	0.15	
	225.0	0.23	
ISOVER Facade (insulation+coating)	50.0	0.10	0.031
	75.0	0.13	
Woodchip	100.0	0.20	0.080
Wind protection woodfibre slab	12.0	0.10	0.050

Table 4 Values used in comparison calculations.

Figure indicative only.

The reference conditions correspond to typical November conditions. In the diagrams, the blue line depicts the prevailing absolute air humidity (g/m³) in the structure, and the red line indicates the air saturation humidity (g/m³) at different temperatures. No moisture condensation occurs in the structure (RH% <100%) when the lines do not intersect each other.

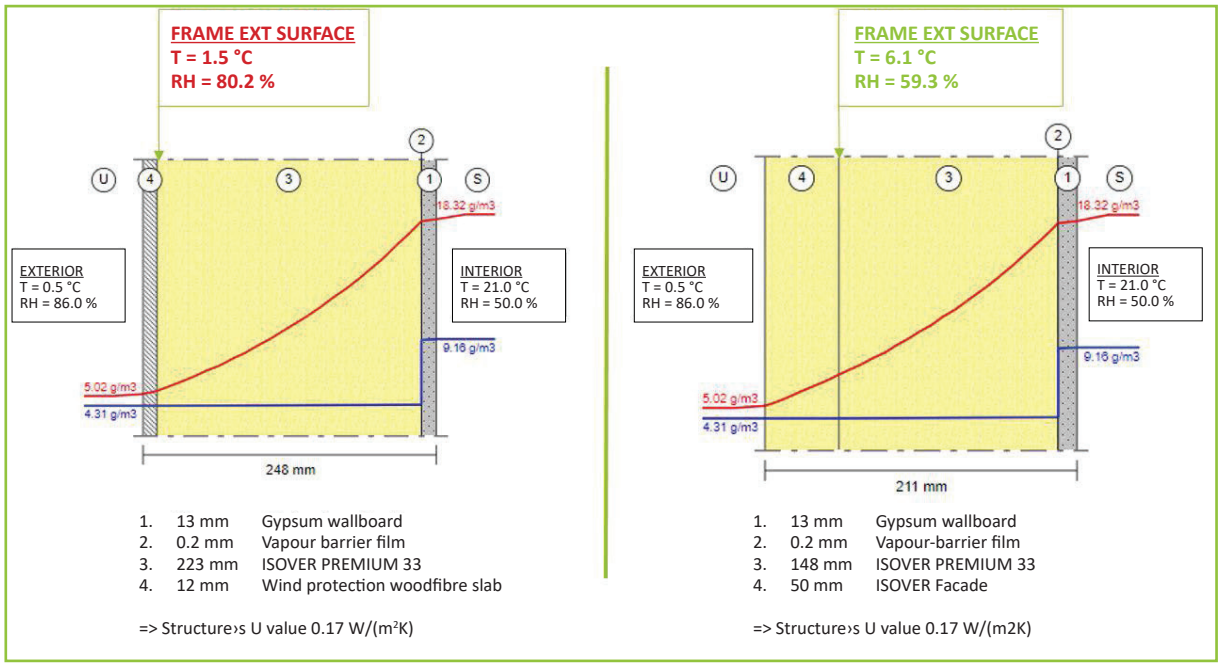


Fig. 5 Relative humidity and temperature on the external surface of the timber frame U = 0.17 W / m²K U = 0.17 W/m²K in reference structures.

It can be seen from the diagrams in Figure 5 that already 50 mm of thermal insulation on the external surface of the frame raises the temperature of the structure at the focal point by more than 4.5 degrees Celsius and at the same time the relative humidity drops from 80% to less than 60% at the focal point. So the wooden parts of the structure are in clearly drier conditions in the humid weather conditions of the autumn season. The warmer and drier the conditions of the timber frame, the higher the proportion of insulation outside the frame. Figure 6 shows the same U = 0.17 W/m^{2}K wall structure with 75 mm thick Facade insulation and a 123 mm insulated timber frame.

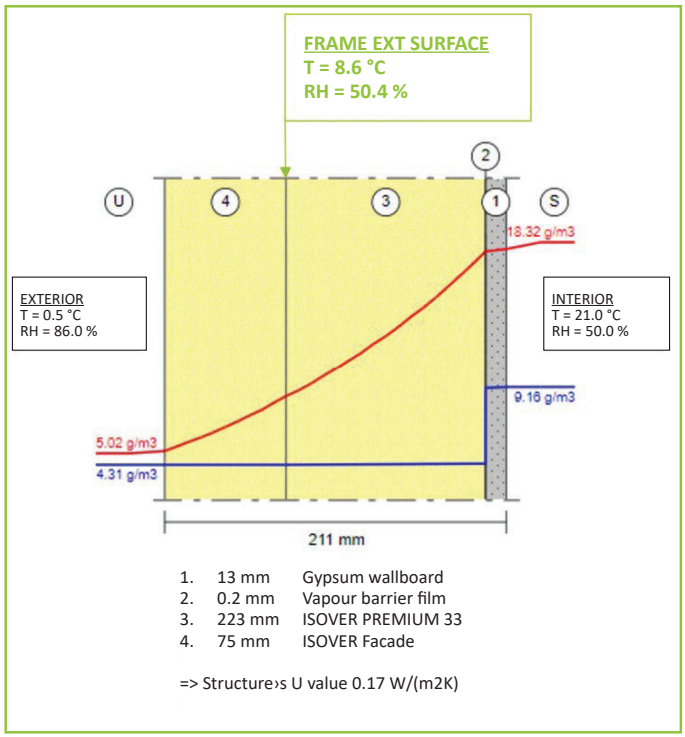


Fig. 6 Effect of wind protection insulation thickness on the temperature of the external surface of the frame.

Facade as additional thermal insulation in an old external wall structure

Figure 7 on the left shows an old timber frame insulated with sawdust and plated on both sides with building boards, on the external surface wood fibre wind protection and on the inner surface an interior plasterboard. Between the timber frame and the interior board there is a tightly fitted air barrier paper. In the right-hand picture the structure is the same but on the external surface of the old wind protection slab ISOVER Facade 50 mm has been added for thermal insulation. The reference conditions correspond to typical November conditions.

Figure indicative only.

The U value of the original structure is almost halved thanks to the additional uniform thermal insulation of 50 mm. Simultaneously at the level of the external surface of the timber frame, conditions become warmer and drier. External additional thermal insulation is therefore a safe way to add insulating capacity. It is important to ensure the condition and functioning of the structure to be additionally insulated. Defective materials must be replaced and the causes of any damage investigated and repaired. The inner surface of the structure must have an airtight vapour barrier, and the moisture performance of the structure (e.g. adequate water vapour resistance of the air/vapour barrier) as a whole must be ensured on a case-by-case basis by the designer.

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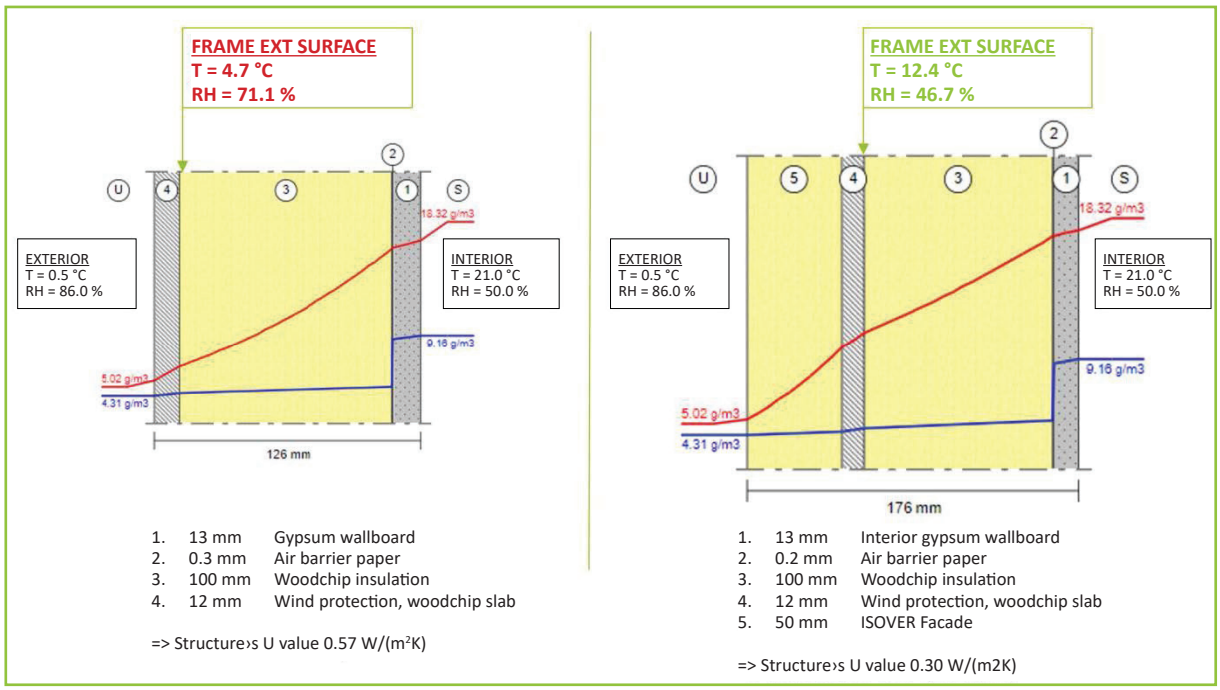

Fig. 7 Relative humidity and temperature on the external surface of the timber frame in an old and additionally insulated structure.

Facade insulation slabs do not contain organic matter and the product can be considered to belong to the mould susceptibility class 3 (HHL 3) of building materials. The rating is divided into four steps and category 1 is the most sensitive to mould (https://research.tuni.fi/rakennusfysiikka/suomalainen-homemalli/). Because Facade insulation raises the temperature of the structure inside the insulation (and lowers the relative humidity), it is possible to use for wind protection slabs of class HHL 1-2 behind Facade wind protection insulation, for example, for strengthening the building and/or for fireproofing purposes (compatibility of materials to be checked on a case-by-case basis). For stiffening and fireproofing it is recommended to use the Glasroc GTX 9 wind barrier slab compatible with Facade.

9. Thermal insulation outside a solid timber structure

Fig. 8 CLT structure insulated from outside.

The ISOVER OL-33 Facade insulation slabs are suitable for thermal insulation and wind protection of CLT and LVL solid timber boards behind a ventilated facade. Thermal insulation of a structure can be implemented effectively with thick insulation slabs. Between the facade and the timber board, the ISOVER Vario® Xtra vapour barrier system can be used to ensure airtightness, provided that the calculations ensure that the heat resistance ratio of the internal and external structures of the Vario vapour barrier is sufficient. We are on the safe side if

the external thermal resistance of the said vapour barrier is at least 4 times higher than the internal thermal resistance. This is achieved, for example, with a combination of a 120 mm CLT board and a 150 mm ISOVER OL-33 Facade slab, in which the thermal resistance of the CLT is 1.09 m^2K/W and that of the OL-33 insulation 4.5 W/m^2K. In the calculations the thermal conductivity of the CLT is λ_D = 0.11 W/mK.

If the ISOVER VARIO® Xtra vapour barrier system is not used in a structure, the solid timber board inside the thermal insulation must be thick enough to act as a vapour barrier in the structure and the slab joints and bushings in the slab must be airtight. Sealings can be made on a timber board with the same ISOVER VARIO® sealing products as on the VARIO® Xtra vapour barrier.

A ventilated facade can be installed on top of ISOVER OL-33 Facade:

- masonry Kahi Facade - anchored to the structure with brick ties
- renderboarded SerpoVent PRO1 – anchored to the structure with Serpovent brackets
- timber cladding – anchored to the structure with screws and TermoFix spacers.

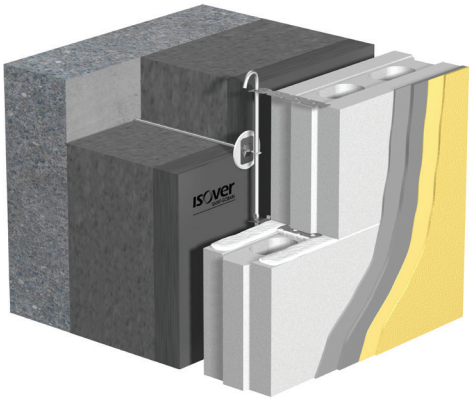

Fig. 9 Facade with Kahi Facade

Fig. 10 SerpoVent U Wall bracket parts A-B, and SerpoVent hat sections installed in OL-33 insulation and CLT board

If necessary, Gyproc GEK 13 (K2 10) is used on the inner surface of the solid timber board in accordance with the requirements of the object or the GFL 18 (K2 30) plasterboard.

Figure 11 shows the temperatures and relative humidity determined by the DOF thermal program in a structure with a 120 mm CLT timber board and insulated with ISOVER OL-33 Facade 150 mm. The structure in Figure 11 does not have a vapour barrier film between the CLT board and thermal insulation.

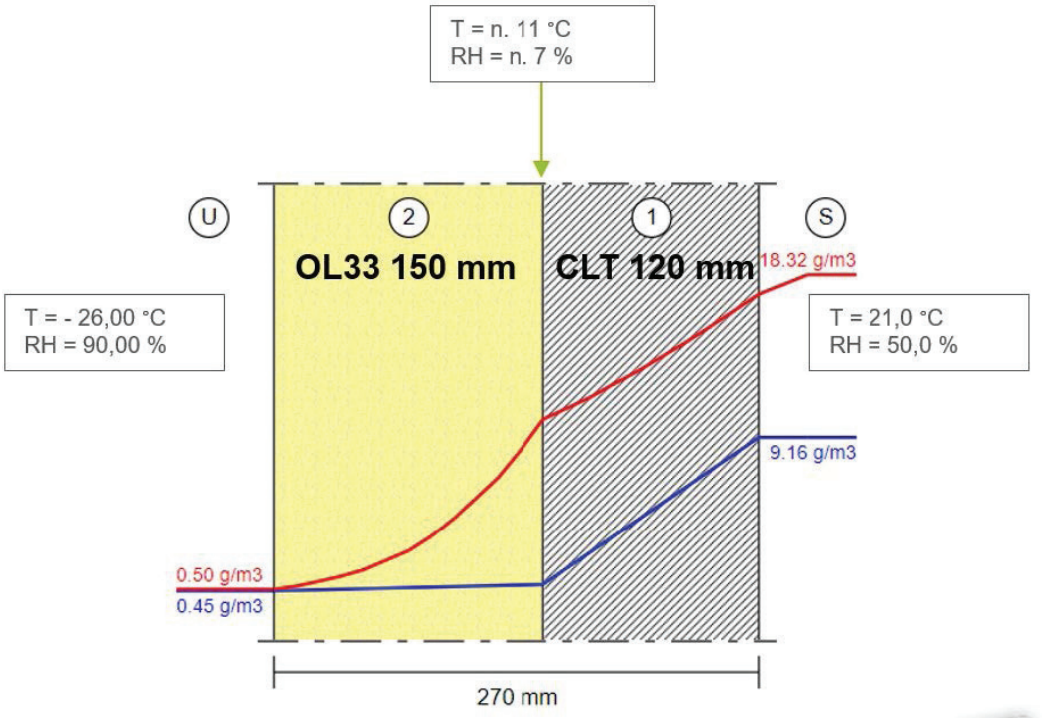

Fig. 11 Externally insulated CLT structure without a vapour barrier.

Effect of the fastening screws (RST) of the external cladding ventilation battenings on the U value of a structure insulated with OL-33 in CLT and LVL structures.

Effect of RST screws on the thermal insulation capacity Uc of CLT / LVL structures with ISOVER OL-33 Facade wind barrier insulation on the external surface of a solid timber board										
FRAME BOARD		ISOVER OL-33	SCREWS		U	U_c	R_T	R_f/R_T	ΔU_f	Screws ≤ kpl/m² with $U_c \leq 0.17$
TYPE (CLT/LVL)	B (mm)	B (mm)	n (pcs/m²)	Ø (mm)	W/(m²K)	W/(m²K)	m²K/W		W/(m²K)	
CLT	100	180	3	8	0.1510	0.16	6.6236	0.8235	0.0091	7.90
CLT	120	150	3	8	0.1696	0.18	5.8964	0.7709	0.0096	1.66
CLT	120	180	3	8	0.1469	0.16	6.8055	0.8015	0.0086	9.74
CLT	140	150	3	8	0.1645	0.17	6.0782	0.7478	0.0090	3.46
CLT	140	180	3	8	0.1431	0.15	6.9873	0.7806	0.0082	11.67
CLT	270	120	3	8	0.1575	0.16	6.3509	0.5726	0.0066	7.94
LVL	45	180	3	8	0.1650	0.18	6.0607	0.9000	0.0109	2.74
LVL	75	180	3	8	0.1589	0.17	6.2915	0.8670	0.0101	4.75
LVL	100	180	3	8	0.1542	0.16	6.4838	0.8413	0.0095	6.54
LVL	120	180	3	8	0.1507	0.16	6.6376	0.8218	0.0091	8.04
LVL	140	180	3	8	0.1472	0.16	6.7915	0.8031	0.0086	9.60
Thermal resistances and conductivities used in the calculation: R_{si} and R_{se} 0.13 W/m²K. λ_{CLT} 0.11 W/mK, λ_{LVL} 0.13 W/mK and λ_{RST} 20 W/mK.										

Table 5 Effect of facade fastening screws (mechanical fasteners) on the U value of a structure.

Corrected U value $U_c = U + \Delta U_f$.

10. U values of Facade external wall structures with different frame structures and insulation materials

On the inner surface of the structure a ≥ 12.5 mm plasterboard and a vapour barrier, e.g. Isover Vario® Xtra. Timber studs ctrs 600 mm.

1. Structural solutions for external walls for a warm space (U ≤ 0.17 W/m²K)			
External wall structures	The quality of the insulation material filling the frame space at least	Wind protection solution	U value W/(m²K)
Frame 42x223 Horizontal battening 48x48 Frame 48x173 ctrs600	ISOVER PREMIUM 33	Glasroc H GHS 9 Storm, Gyproc GTX / GTS 9	0.17[1)]
Frame 42/48x223	ISOVER PREMIUM 33	Woodfibre-based wind protection slab 12 mm, λD ≤ 0.05 W/(mK)	0.17[1)]
Frame 42x198	ISOVER EXTREME 32	Woodfibre-based wind protection slab 25 mm, λD ≤ 0.05 W/(mK)	0.17[1)]
Frame 48x198	ISOVER EXTREME 31		
Frame 42/48x223	ISOVER PREMIUM 33	ISOVER Facade EJ	0.14 / 0.15[0)]
Frame 42/48x198	ISOVER EXTREME 31		0.15 / 0.16[0)]
Frame 42/48x198	ISOVER STANDARD 37		0.17[0)]
Frame 42x173	ISOVER EXTREME 32		0.17[0)]
Frame 48x173	ISOVER EXTREME 31		
Frame 42x223	ISOVER EXTREME 31	ISOVER Facade 50 mm	0.12[0)]
Frame 48x223	ISOVER PREMIUM 33		0.13[0)]
Frame 42x173	ISOVER PREMIUM 33		0.15[0)]
Frame 48x173	ISOVER EXTREME 32		0.15[0)]
Frame 42/48x148	ISOVER PREMIUM 33		0.17[0)]
Horizontal battening 48x48 Frame 42/48x198 ctrs600	Isover Premium 33	ISOVER Facade 100 mm	≤ 0.10[0)]
2. Structural solutions for external walls for a semi-warm space (U ≤ 0.26 W/m²K)			
External wall structures	The quality of the insulation material filling the frame space at least	Wind protection solution	U value W/(m²K)
Frame 42/48x148	ISOVER PREMIUM 33	Glasroc H GHS 9 Storm, Gyproc GTX / GTS 9	0.25[1)]
	ISOVER STANDARD 37	Woodfibre-based wind protection slab 12 mm, λD ≤ 0.05 W/(mK)	0.26[1)]
Frame 42/48x123	ISOVER EXTREME 31		
Frame 42/48x123	ISOVER PREMIUM 33	wind protection slab 25 mm, λD ≤ 0.05 W/(mK)	0.25[1)]
Frame 42/48x98	ISOVER EXTREME 31	ISOVER Facade EJ	0.26[0)]
3. Solid timber and concrete wall solution			
CLT ≥ 40 mm, λD ≤ 0.11 W/(mK)		ISOVER OL-33 - 180 mm	0.16[0)]
CLT 100 mm, λD ≤ 0.11 W/(mK)		ISOVER OL-33 - 180 mm	0.15[0)]
CLT 120 mm, λD ≤ 0.11 W/(mK)		ISOVER OL-33 - 150 mm	0.17[0)]
CLT 120 mm, λD ≤ 0.11 W/(mK)		ISOVER OL-32 - 150 mm	0.17[0)]
CLT 140 mm, λD ≤ 0.11 W/(mK)		ISOVER OL-33 - 150 mm	0.16[0)]
CLT 220 mm, λD ≤ 0.11 W/(mK)		ISOVER OL-33 - 120 mm	0.17[0)]
CLT 260 mm, λD ≤ 0.11 W/(mK)		-	0.40[3.0)]
CLT 180 mm, λD ≤ 0.11 W/(mK)		-	0.55[3.0)]
LVL 75 mm, λD ≤ 0.13 W/(mK)		ISOVER OL-33 - 180 mm	0.16[0)]
Concrete casing LVL 75 mm, λD ≤ 1.7 W/(mK)		ISOVER OL-33 - 120 mm	0.26[0)]
Concrete casing LVL 75 mm, λD ≤ 1.7 W/(mK)		ISOVER OL-33 - 180 mm	0.17[0)]
Concrete casing LVL 75 mm, λD ≤ 1.7 W/(mK)		ISOVER OL-33 - 205 mm	0.15[0)]

The calculation does not take into account the facade brackets that penetrate the wind protection insulation (by default, the proportion of brackets is max. 3% of the U value).

[0)] The correction factor for air gaps used in calculation is of correction level 0.

[1)] The correction fact or for air gaps used in calculation is of correction level 1.

[3)] Mainly solid timber structures, where it is possible to apply lower reference values for the heat transfer coefficient.

On the inner surface of the structure, a fireproofing class is achieved: K2 10, when sheeted with ≥ Gyproc 125 mm plasterboard. K2 30, when sheeted with ≥ Gyproc GFL 18 FireLine, or Gyproc GN/GEK 12.5 mm + GFL 15 Fireline.

On the external surface of the structure, a fireproofing class is achieved: K2 10, when sheeted with ≥ Gyproc GTX 9, GTS 9, Glasroc 9 Storm or ISOVER OL-33 FACADE ≥ 120 mm. EI 30when sheeted with Facade 50 mm + Gyproc GTS 9.

Table 6 Heat transfer coefficient of newbuild structures with ISOVER insulation solutions.

Well-ventilated air gap in the external surface of structures in the back of facade cladding. Facade for example: wood panelling + battening, SerpoVent facade system, masonry facade, etc. For the U-value calculation, a porous fibre slab 15 mm λD ≤ 0.05 W / (mK) and frame posts and battenings ctrs 600 mm have been used on the inner surface of the structure.

4. Additional insulation of an old exterior wall structure from the outside on the surface of an existing wind protection

External wall structures	The quality of the insulation material filling the frame space at least	Wind protection solution	U value W/(m²K)
Frame 50x100	Woodchip used in calculation λ_D = 0.08 W/(mK)	ISOVER Facade EJ 25 mm	0.36[0)]
		ISOVER Facade 50 mm	0.28[0)]
		ISOVER Facade 75 mm	0.23[0)]
		ISOVER Facade 100 mm	0.19[0)]

Outside an old wall structure, additional insulation can be made with Isover Facade wind protection insulation by attaching the insulation slabs tightly to the surface of the existing rigid wind protection slab or close boarding (no gaps must be left between the structural layers to prevent cold air from being conducted to the back of the new insulation). Installation of Facade insulation slabs and sealing of the wind protection coating according to the Facade installation instructions.Before carrying out further insulation you must ensure e.g. the following things:

- Air/vapour barrier: The inner surface of the wall structure has a functioning, tight air/vapour barrier with sufficient water vapour resistance.
- Load-bearing frame structure: The frame is intact/in good condition and stable/stiffened properly. The insulation material is intact and fills the insulation space tightly.
- Frame external surface: The old wind protection and/or close boarding is intact and tightly installed. If necessary, an Isover KH glass wool mat can be installed as a sealing/levelling wool on the mounting surface of a new Facade insulation slab.

Additional insulation and alteration work on a facade must always be carried out in accordance with site-specific design!

5. Renovation of the insulation of an old external wall structure and additional insulation from the outside

External wall structures	The quality of the insulation material filling the frame space at least	Wind protection solution	U value W/(m²K)
Frame 50x100	ISOVER EXTREME 31	ISOVER Facade 75 mm	0.17[0)]
Frame 50x100	ISOVER STANDARD 37	ISOVER Facade 100 mm	0.16[0)]

The wall structure is opened from the outside and the insulation inside the frame is removed and replaced with new Isover insulation. A possible stiffening board, such as a Gyproc 9 mm wind protection slab, is installed on the outer surface of the structure in accordance with site-specific modification work plans. An Isover Facade wind protection insulation slab can be installed on top of this according to the product installation instructions. Before carrying out insulation work you must ensure e.g. the following things:

- Air/vapour barrier: The inner surface of the wall structure has a functioning, tight air/vapour barrier with sufficient water vapour resistance.
- Load-bearing frame structure: The frame is intact/in good condition and stable/stiffened properly.

Additional insulation and alteration work on a facade must always be carried out in accordance with site-specific design!

6. Renovation of the insulation of an old external wall structure and additional insulation from the inside (If additional insulation from the outside is not possible and/or old insulation and air barrier need to be replaced)

External wall structures	The quality of the insulation material filling the frame space at least	Additional insulation solution for the inside	U value W/(m²K)
Frame 50x100	ISOVER PREMIUM 33	ISOVER In/Aluliner 25 mm	0.23[0)]
Frame 50x100	ISOVER PREMIUM 33	Horizontal battening 48x98 / ISOVER PREMIUM 33	0.17[1)]

The wall structure is dismantled from the inside, removing the insulation, air/vapour barrier and interior cladding from the existing structure. New vapour barrier (e.g. Isover Vario Xtra) is installed between the new internal frame and the interior cladding).Before carrying out alterations, you must ensure e.g. the following things:

- Load-bearing frame structure: The frame is intact/in good condition and stable/stiffened properly.
- Frame external surface: The old wind protection is intact and tightly installed.

Additional insulation and alteration work on a facade must always be carried out in accordance with site-specific design!

NOTE!
For facade alterations and/or repairs, a building permit must always be applied for in accordance with the instructions of the local building control authority. The permit application shall designate the persons responsible for the repair work, and it shall be accompanied by site-specific repair work plans and other possible annexes required by the building control authority.

Table 7 Heat transfer coefficient of renovation structures with ISOVER insulation solutions.

APPENDIX 1. Structure types

Newbuilds:

code	Contents
AP3101	Heated space base floor, adjacent to open air
AP3102	Heated space base floor, adjacent to open air
AP3103	Heated space base floor, adjacent to open air
AP3104	Heated space base floor, adjacent to open air
YP2101	Heated space slanting timber roof slab
YP2104	Heated space slanting timber roof slab
US1101	Heated space external wall, timber frame, weatherboard cladding
US1102	Heated space external wall, timber frame, weatherboard cladding
US1202	Heated space external wall, timber frame, brick cladding
US3202	Heated space external wall, reinforced concrete frame, outer leaf
US3205A	Heated space external wall, reinforced concrete frame, ventilated facade
3201A	Heated space external wall, reinforced concrete frame, outer leaf
US8101	Heated space external wall, CLT solid timber frame, weatherboard cladding
US8102	Heated space external wall, CLT solid timber frame, weatherboard cladding
US8201	Heated space external wall, CLT solid timber frame, brick cladding
US8202	Heated space external wall, CLT solid timber frame, brick cladding
US8301	Heated space external wall, CLT solid timber frame, ventilated facade

Renovation structures:

code	Contents
AP1.2	Old base floor with crawl space, replacement of insulation and additional insulation on topside
US1.1	Additional insulation of old weatherboarded timber wall from outside
US2.1	Additional insulation of old woodchip-insulated timber wall from outside
US2.2	Additional insulation of old woodchip-insulated timber wall from outside
US3.1	Additional insulation of old log wall from outside
US3.2	Additional insulation of old log wall from outside

APPENDIX.2 ISOVER Facade :Details

General

code	Contents
0.	ISOVER Facade – details, cover
01.	Instructions for external additional thermal insulation, 2 pages
02.	ISOVER Facade – dry chain of insulation slabs
03.	ISOVER Facade – fastening instructions for insulation slabs, 3 pages
04.	Fastening instructions for timber facade ISOVER FACADE - LCT/LVL, 2 pages
05.	ISOVER Facade – Sealing instructions, 2 pages
06.	ISOVER Facade – Sealing strips, 2 pages

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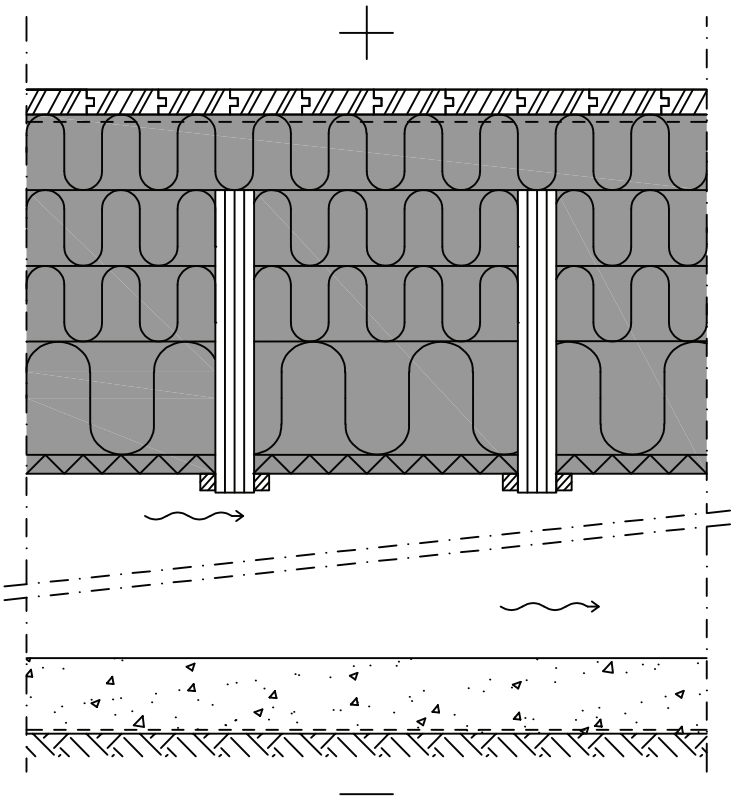
Newbuilds:

code	Contents	
1a.	External wall and base floor junction cross-section:	US balloon frame / AP ground-supported
1b.	External wall and base floor junction cross-section:	US solid timber / AP ground-supported
2a.	External wall and base floor junction cross-section:	US balloon frame / AP with crawl space
2b.	External wall and base floor junction cross-section:	US solid timber / AP with crawl space
3a.	External wall and base floor junction cross-section:	US balloon frame / AP freely ventilated
3b.	External wall and base floor junction cross-section:	US solid timber / AP freely ventilated
4a.	External wall and intermediate floor junction cross-section:	US balloon frame / VP
4b.	External wall and intermediate floor junction cross-section:	US solid timber / VP
5a.	External wall and roof slab junction cross-section:	US balloon frame / YP straight
5b.	External wall and roof slab junction cross-section:	US solid timber / YP straight
6a.	External wall and roof slab junction cross-section:	US balloon frame / YP slanting
6b.	External wall and roof slab junction cross-section:	US solid timber / YP slanting
7a.	Window junction	US balloon frame / Window
7b.	Window junction	US solid timber / Window
8a.	Outside corner joint of external wall panels	US balloon frame
8b.	Outside corner joint of external wall panels	US solid timber
9a.	Straight joint of external wall panels	US balloon frame
9b.	Straight joint of external wall panels	US solid timber

Renovation:

code	Contents	
10a.	External wall and ground-supported base floor junction:	US solid timber / AP ground-supported
10b.	External wall and ground-supported base floor junction:	US solid timber / AP ground-supported
10c.	External wall and ground-supported base floor junction:	US solid timber / AP ground-supported
10d.	External wall and ventilated base floor junction:	US / AP freely ventilated
11a.	External wall and slanting roof slab junction:	US / P slanting

Construction site	Contents	**Heated space base floor, adjacent to open air**
Designer	Work n:o	**AP 3101**
	Date	



Structure from top down

	Surface material and/or treatment according to room description
33 mm	Floorboard 33x95 mm, tongue-and-groove
	Vapour barrier ISOVER VARIO ® Xtra
	Base floor support structures according to structural design
100 mm	Thermal insulation ISOVER PREMIUM 33 + battenings 48x98m ctrs600
350 mm	Thermal insulation ISOVER PREMIUM 33 + load-bearing structure, here ctrs400
25 mm	Thermal insulation/ wind protection slab ISOVER FACADE EJ
	Support battening for thermal insulation
> 800 mm	Ventilated crawl space
	Capillary-breaking layer/thermal insulation, e.g. LECA or crushed stone
	Non-woven fabric (if necessary)
	Foundation soil, inclination of excavation boundaries to drains 1:100

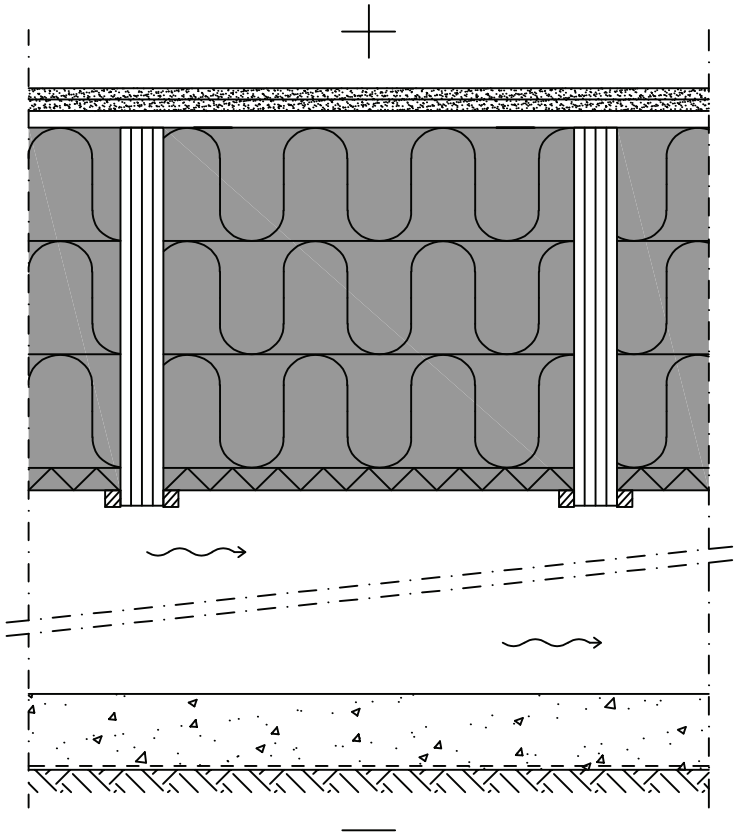
Heat transfer coefficient
U value 0.09 W/m^{2}K

Reference value for the heat transfer coefficient (U-value) of the base floor adjacent open air is 0.09 W/m^{2}K.

VARIATION	INSULATION LAYER	U VALUE
A	ISOVER PREMIUM 33450 mm + ISOVER FACADE EJ 25 mm	U = 0.09
B	ISOVER PREMIUM 33400 mm + ISOVER FACADE EJ 25 mm	U = 0.10

U value correction term $\Delta U=\Delta U_g$ =0.010 W/m^{2}K. Timber frame through insulation layer.

Construction site	Contents	**Heated space base floor, adjacent to open air**
Designer	Work n:o	**AP 3102**
	Date	



Structure from top down

	Surface material and/or treatment according to room description
2x15 mm	Gyproc GL15 Lapikas floor board, board joints overlapping
22 mm	Spaced boards 22x100 ctrs300
	Vapour barrier ISOVER VARIO ® Xtra
	Load-bearing structures according to structural design, here ctrs600
450 mm	Thermal insulation ISOVER PREMIUM 33 (3 x 150 mm)
25 mm	Thermal insulation and wind protection slab ISOVER FACADE EJ
	Support battening for thermal insulation
> 800 mm	Ventilated crawl space
	Capillary-breaking layer/thermal insulation, e.g. LECA
	Non-woven fabric (if necessary)
	Foundation soil, inclination of excavation boundaries to drains 1:100

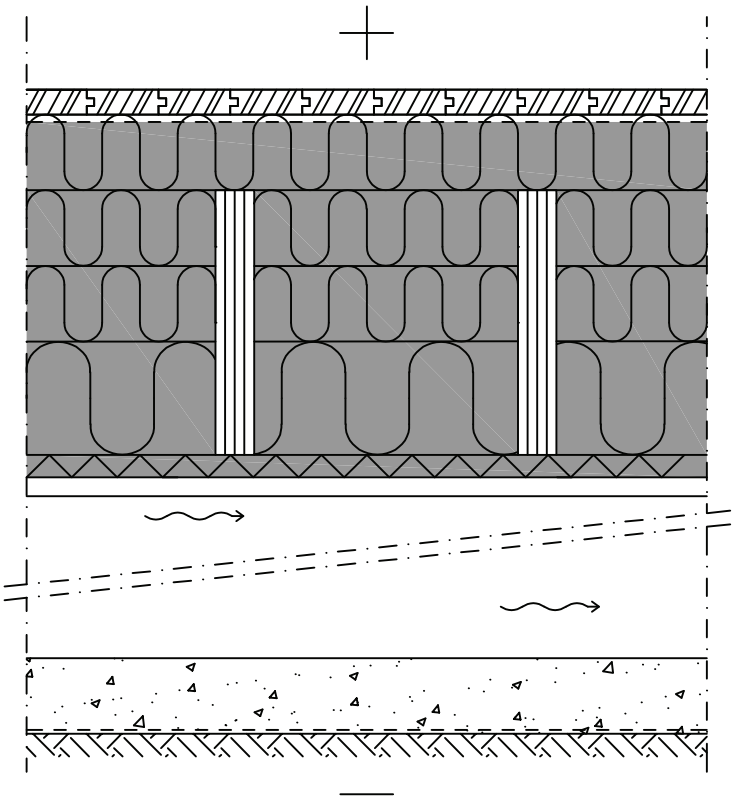
U value 0.09 W/m^{2}K

Heat transfer coefficient

VARIATION	INSULATION LAYER	U VALUE
A (open base floor)	ISOVER PREMIUM 33450 mm + ISOVER FACADE 25 mm	U = 0.09
B (open base floor)	ISOVER PREMIUM 33400 mm + ISOVER FACADE 25 mm	U = 0.10

U value correction term $\Delta U=\Delta U_g$ =0.010 W/m^{2}K. Timber frame through insulation layer.

Construction site	Contents	**Heated space base floor, adjacent to open air**
Designer	Work n:o	**AP 3103**
	Date	



Structure from top down

	Surface material and/or treatment according to room description
33 mm	Floorboard 33x95 mm, tongue-and-groove
	Vapour barrier ISOVER VARIO ® Xtra
	Base floor support structures according to structural design
100 mm	Thermal insulation ISOVER PREMIUM 33 + battening 48x98 mm ctrs600
350 mm	Thermal insulation ISOVER PREMIUM 33 + load-bearing structure, here ctrs400
25 mm	Thermal insulation/ wind protection slab ISOVER FACADE EJ
	Support battening for thermal insulation
> 800 mm	Ventilated crawl space
	Capillary-breaking layer/thermal insulation, e.g. LECA or crushed stone
	Non-woven fabric (if necessary)
	Foundation soil, inclination of excavation boundaries to drains 1:100

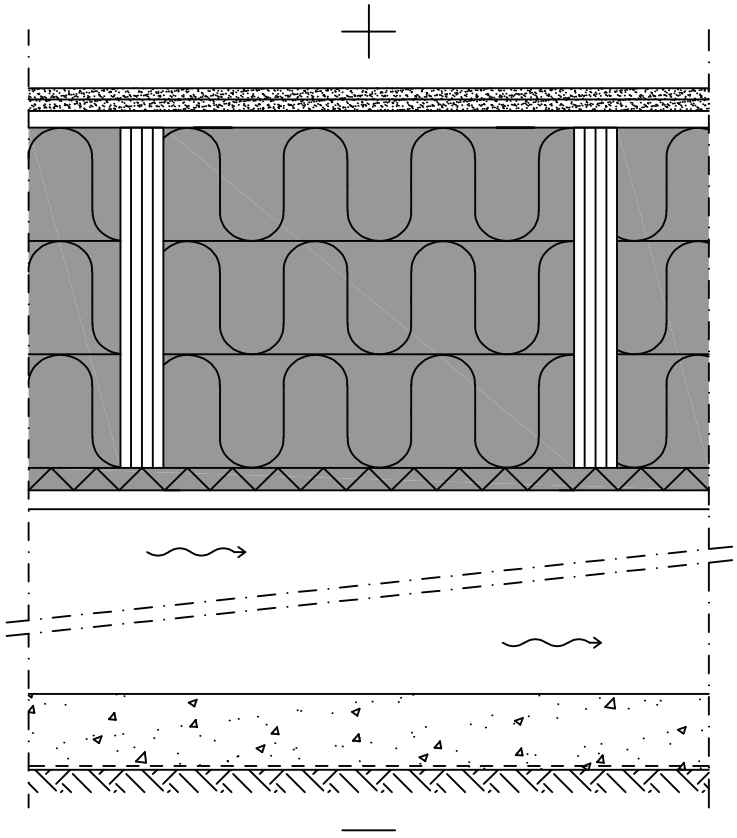
Heat transfer coefficient
U value 0.08 W/m^{2}K

Reference value for the heat transfer coefficient (U-value) of the base floor adjacent open air is 0.09 W/m^{2}K.

VARIATION	INSULATION LAYER	U VALUE
A	ISOVER PREMIUM 33450 mm + ISOVER FACADE EJ 25 mm	U = 0.08
B	ISOVER PREMIUM 33400 mm + ISOVER FACADE EJ 25 mm	U = 0.09

U value correction term $\Delta U=\Delta U_g$ =0.000 W/m^{2}K.

Construction site	Contents	**Heated space base floor, adjacent to open air**
Designer	Work n:o	**AP 3104**
	Date	



Structure from top down

	Surface material and/or treatment according to room description
2x15 mm	Gyproc GL15 Lapikas floor board, board joints overlapping
22 mm	Spaced boards 22x100 ctrs300
	Vapour barrier ISOVER VARIO ® Xtra
	Load-bearing structures according to structural design, here ctrs600
450 mm	Thermal insulation ISOVER PREMIUM 33 (3 x 150 mm)
25 mm	Thermal insulation and wind protection slab ISOVER FACADE EJ
	Support battening for thermal insulation
> 800 mm	Ventilated crawl space
	Capillary-breaking layer/thermal insulation, e.g. LECA
	Non-woven fabric (if necessary)
	Foundation soil, inclination of excavation boundaries to drains 1:100

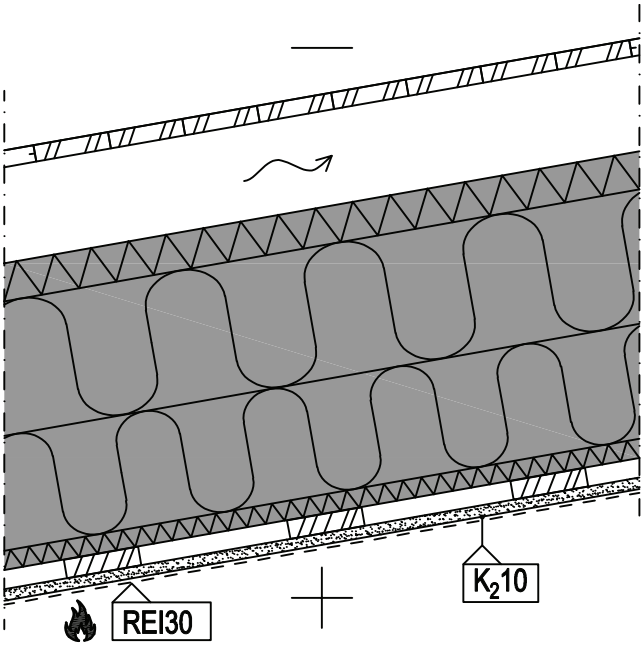
U value 0.08 W/m^{2}K

Heat transfer coefficient

VARIATION	INSULATION LAYER	U VALUE
A (open base floor)	ISOVER PREMIUM 33450 mm + ISOVER FACADE 25 mm	U = 0.08
B (open base floor)	ISOVER PREMIUM 33400 mm + ISOVER FACADE 25 mm	U = 0.09

U value correction term $\Delta U=\Delta U_g$ =0.000 W/m^{2}K.

Construction site	Contents	**Heated space slanting timber roof slab**
Designer	Work n:o	**YP 2101**
	Date	



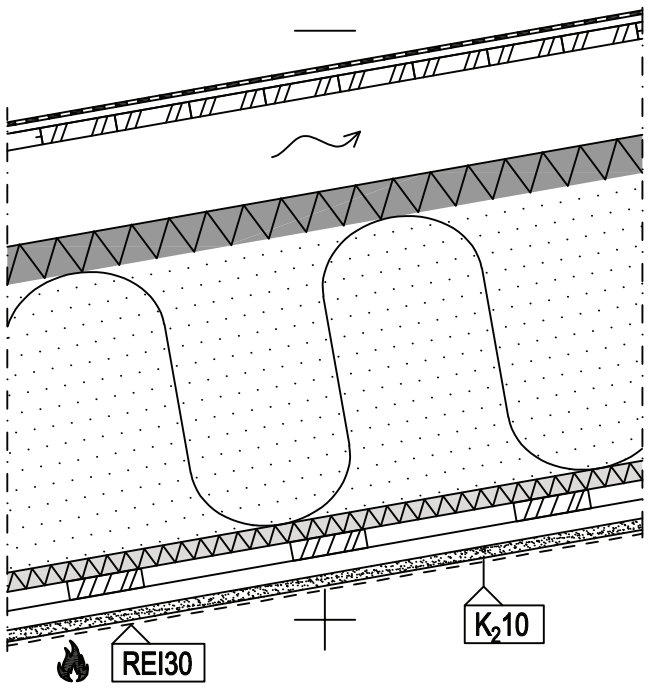
	STRUCTURE FROM TOP DOWN
	Steel roofing or other roofing and roof battening with underlay according to structural design
≥ 100 mm	Ventilated air gap
50 mm	Wind protection and thermal insulation ISOVER FACADE or ISOVER RKL-31, to be mounted between roof supporters
325 mm	Wool slab ISOVER PREMIUM 33
	Roof supporters according to the structural design, here ctrs900
25 mm	Rigid wool with vapour barrier ISOVER AluLiner or ISOVER Vario InLiner
22 mm	Spaced boards 22x100 ctrs300
13+13/15 mm	Plasterboard GYPROC GN 13 x2 or GYPROC GFL15
	Surface treatment according to room description

Fire resistance class REI30 to class 2xGN 13 or acc. to instructions for GF15 Gyproc

VERSION	INSDULATION LAYERS	sheeting	U VALUE	REI
1	AluLiner 25mm + PREMIUM 33325 mm + RKL-3150 mm	GN13	U = 0.09	-
2	AluLiner 25mm + PREMIUM 33325 mm + RKL-3150 mm	GN13+GN13	U = 0.09	30
3	AluLiner25mm + PREMIUM 33325 mm + RKL-3150 mm	GFL15	U = 0.09	30
4	AluLiner 25mm + PREMIUM 33425 mm + RKL-3150 mm	GN13	U = 0.07	-
5	AluLiner 25mm + PREMIUM 33425 mm + RKL-3150 mm	GN13+GN13	U = 0.07	30
6	AluLiner 25mm + PREMIUM 33425 mm + RKL-3150 mm	GFL15	U = 0.07	30

U value correction term ΔU =0.000 W/m²K.

Construction site	Contents	**Heated space base floor, adjacent to open air**
Designer	Work n:o	**YP 2104**
	Date	



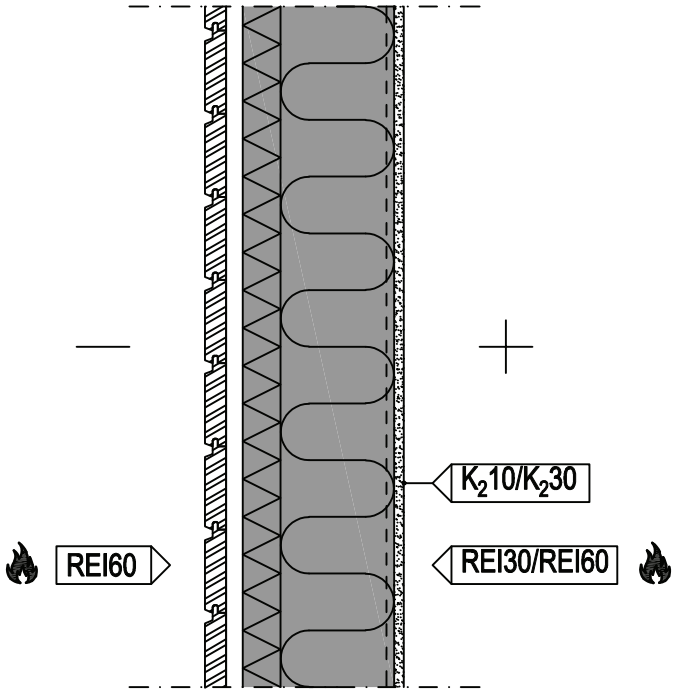
	STRUCTURE FROM TOP DOWN
	Steel roofing or other roofing and roof battening with underlay according to structural design
≥100 mm	Ventilated air gap
50 mm	Wind protection and thermal insulation ISOVER FACADE or ISOVER RKL-31, to be mounted between roof supporters
375 mm	ISOVER InsulSafe non-shrinking loose-fill wool
	Roof supporters according to the structural design, here ctrs900
25 mm	Rigid wool with vapour barrier ISOVER AluLiner or ISOVER Vario InLiner
22+22 mm	Spaced boards 22x100 x2 ctrs300
13+13/15 mm	Plasterboard GYPROC GN 13 x2 or GYPROC GFL15
	Surface treatment according to room description

Fire resistance class REI30 to class 2xGN 13 or acc. to instructions for GF15 Gyproc

VERSION	INSDULATION LAYERS	SHEETING	U VALUE	REI
1	AluLiner 25mm + InsulSafe 375 mm + RKL-3150 mm	GN13	U = 0.09	-
2	AluLiner 25mm + InsulSafe 375 mm + RKL-31 50 mm	GN13+GN13	U = 0.09	30
3	AluLiner 25mm + InsulSafe 375 mm + RKL-3150 mm	GFL15	U = 0.09	30
4	AluLiner 25mm + InsulSafe 525 mm + RKL-3150 mm	GN13	U = 0.07	-
5	AluLiner 25mm + InsulSafe 525 mm + RKL-31 50 mm	GN13+GN13	U = 0.07	30
6	AluLiner 25mm + InsulSafe 525 mm + RKL-3150 mm	GFL15	U = 0.07	30

U value correction term ΔU =0.000 W/m^{2}K.

Construction site	Contents	**Heated space external wall, timber frame, weatherboard cladding**
Designer	Work n:o	**US 1101**
	Date	



STRUCTURE FROM EXTERIOR TO INSIDE

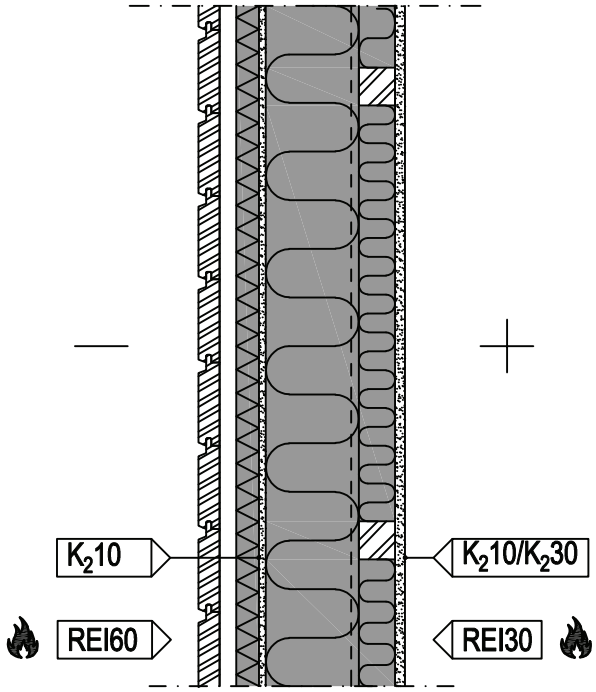
28 mm	External cladding
22 mm	Ventilation gap and battening 22x100 ctrs600
50 mm	Wind protection and thermal insulation ISOVER FACADE, joints to be taped
148 mm	Thermal insulation ISOVER PREMIUM 33 + battening 48x148 ctrs600
	Moisture equalising ISOVER VARIO ® Xtra vapour barrier film, joints to be taped with ISOVER VARIO Multitape SL
13/18 mm	Plasterboard GYPROC GEK13(REI30/$K_2$10), GYPROC Habito(REI30/$K_2$10) or GYPROC GFL18(REI60/$K_2$30) Surface treatment according to room description

Fire resistance class REI30 / REI60 according to sheeting, wall height limited to 3000mm. For an internal fire, stiffening of the outside of the frame is taken into account by installing, for example, Glasroc GTX 9 between Facade and the frame.

VERSION	INSULATION AND BOARD LAYERS	U VALUE	REI ext/int	THICKNESS (mm)
1	FACADE 50 mm+PREMIUM 150 mm+GEK13	U = 0.17	60/30	261
2	FACADE 50 mm+PREMIUM 200 mm+GEK13	U = 0.14	60/30	311
3	FACADE 50 mm+PREMIUM 250 mm+GEK13	U = 0.12	60/30	361
4	FACADE 50 mm+PREMIUM 150 mm+GH13	U = 0.17	60/30	261
5	FACADE 50 mm+PREMIUM 200 mm+GH13	U = 0.14	60/30	311
6	FACADE 50mm+PREMIUM 250 mm+GH13	U = 0.12	60/30	361
7	FACADE 50 mm+PREMIUM 150 mm+GFL18	U = 0.17	60/60	266
8	FACADE 50 mm+PREMIUM 200 mm+GFL18	U = 0.14	60/60	316
9	FACADE 50 mm+PREMIUM 250 mm+GFL18	U = 0.12	60/60	366

U value correction term ΔU =0.000 W/m^{2}K.
Fire load contained in insulation < 12 MJ/m^2.

Construction site	Contents	**Heated space external wall, timber frame and battening**
Designer	Work n:o	**US 1102**
	Date	



STRUCTURE FROM EXTERIOR TO INSIDE

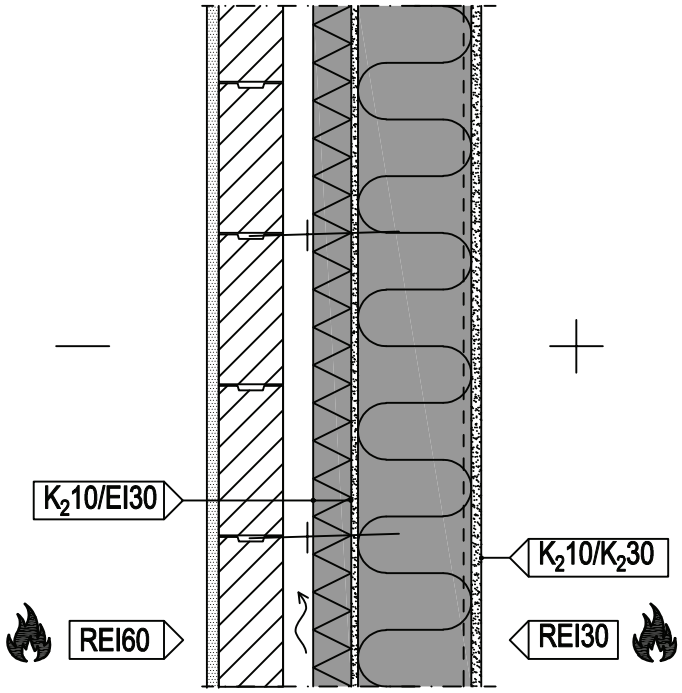
28 mm	External cladding
22 mm	Ventilation gap and battening 22x100 ctrs600
30 mm	Wind protection and thermal insulation ISOVER FACADE, joints to be taped
9 mm	Plasterboard Glasroc GTX 9
123 mm	Thermal insulation ISOVER PREMIUM 33 and load-bearing frame 48x123 ctrs600
	Moisture equalising ISOVER VARIO ® Xtra vapour barrier film, joints to be taped with ISOVER VARIO Multitape SL
48 mm	Thermal insulation ISOVER PREMIUM 33 and battening 48x48 ctrs600
13/18 mm	Plasterboard GYPROC GEK13, GYPROC Habito or GYPROC GFL18(REI30/$K_2$30)
	Surface treatment according to room description

Fire resistance class REI30 / REI60 according to sheeting, wall height limited to 3000mm

VERSION	INSULATION AND BOARD LAYERS	U VALUE	REI ext/int	THICKNESS (mm)
1	FACADE 30 mm+GTX9+PREMIUM 125+50 mm+GEK13	U = 0.17	60/	273
2	FACADE 50 mm+GTX9+PREMIUM 150+50 mm+GEK13	U = 0.14	60/	318
3	FACADE 50 mm+GTX9+PREMIUM 200+50 mm+GEK13	U = 0.12	60/	368
4	FACADE 30 mm+GTX9+PREMIUM 125+50 mm+GH13	U = 0.17	60/	273
5	FACADE 50 mm+GTX9+PREMIUM 150+50 mm+GH13	U = 0.14	60/	318
6	FACADE 50 mm+GTX9+PREMIUM 200+50 mm+GH13	U = 0.12	60/	368
7	FACADE 30 mm+GTX9+PREMIUM 125+50 mm+GFL18	U = 0.17	60/30	278
8	FACADE 50 mm+GTX9+PREMIUM 150+50 mm+GFL18	U = 0.14	60/30	323
9	FACADE 50 mm+GTX9+PREMIUM 200+50 mm+GFL18	U = 0.12	60/30	373

Note! Stiffening capacity of the frame according to GYPROC instructions. U value correction term ΔU =0.000 W/m²K.
Fire load contained in insulation < 12 MJ/m².

Construction site	Contents	**Heated space external wall, timber frame, battening, brick cladding**
Designer	Work n:o	**US 1202**
	Date	



STRUCTURE FROM EXTERIOR TO INSIDE

Plastered Kahi Facade block, Kahi brick or baked brick, brick ties acc. to structural design

40 mm Ventilation gap

50 mm Wind protection and thermal insulation ISOVER FACADE, joints to be taped

9 mm Plasterboard Glasroc GTX 9

148 mm Thermal insulation ISOVER PREMIUM 33 and load-bearing frame 48x148 ctrs600

Moisture equalising ISOVER VARIO ® Xtra vapour barrier film, joints to be taped with ISOVER VARIO Multitape SL

13/18 mm Plasterboard GYPROC GEK13, GYPROC Habito or GYPROC GFL18(REI30/$K_2$30)

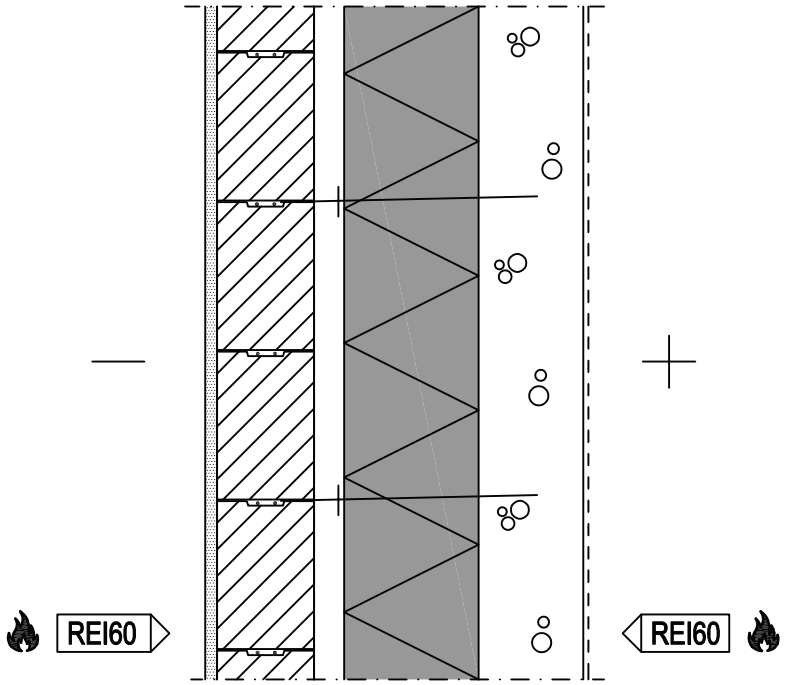
Surface treatment according to room description

Fire resistance class REI30 / REI60 according to sheeting, wall height limited to 3000mm

VERSION	INSULATION AND BOARD LAYERS	U VALUE	REI ext/int	THICKNESS (mm)
1	FACADE 50 mm+PREMIUM 150 mm+GEK13	U = 0.17	60/30	350
2	FACADE 75 mm+PREMIUM 150 mm+GEK13	U = 0.15	60/30	375
3	FACADE 50 mm+PREMIUM 150 mm+GH13	U = 0.17	60/30	350
4	FACADE 75 mm+PREMIUM 150 mm+GH13	U = 0.15	60/30	375
5	FACADE 50 mm+PREMIUM 150 mm+GFL 18	U = 0.17	60/60	353
6	FACADE 75 mm+PREMIUM 150 mm+GFL 18	U = 0.15	60/60	378

Heat transfer coefficient correction term ΔU < 3% from U value (EN 6946). No need to correct the U value.
Fire load contained in insulation < 12 MJ/m^2.

Construction site	Contents	**Heated space external wall, reinforced concrete frame, outer leaf**
Designer	Work n:o	**US 3202**
	Date	



STRUCTURE FROM EXTERIOR TO INSIDE

Plastered Kahi Facade block, Kahi brick or baked brick, brick ties acc. to structural design

40 mm Ventilation gap

180/205 mm Wind protection and thermal insulation ISOVER OL-33 Facade, joints to be taped

Load-bearing reinforced concrete wall, according to structural design

Surface treatment according to room description

Fire resistance class REI60

Heat transfer coefficient ((thermal conductivity used in calculation λ_d)

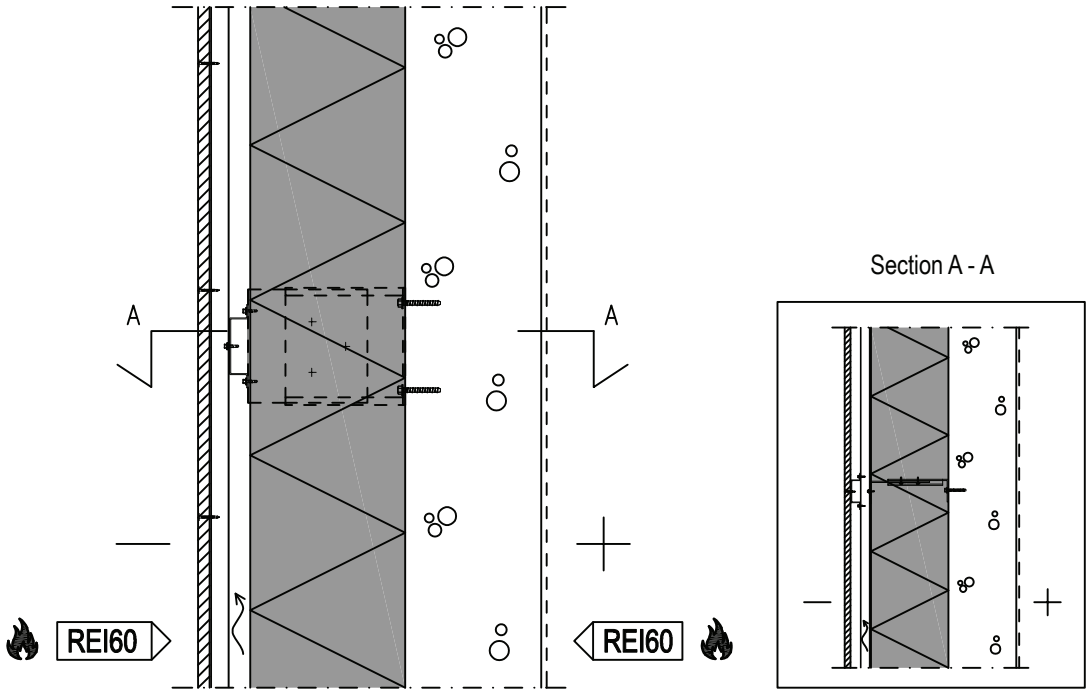
U value 0.17W/m^{2}K

Heat transfer coefficient

VERSION	INSULATION LAYER	U VALUE	REI ext/int
A	ISOVER OL-33 FACADE 205mm	U = 0.16	60/60
B	ISOVER OL-33 FACADE 180mm	U = 0.18	60/60

U value correction term $\Delta U=\Delta U_f$ =0.0051 W/m^{2}K, RST brick ties 4-6 pcs/m^2 through insulation layers..
Fire load contained in insulation < 12 MJ/m^2.

Construction site	Contents	**Heated space external wall, reinforced concrete frame, ventilated facade**
Designer	Work n:o	**US 3205A**
	Date	



180/205 mm

STRUCTURE FROM EXTERIOR TO INSIDE
Ventilated facade cladding, Permabase renderboard 12.5mm + SerpoVent two-coat plasterwork
Ventilation gap and steel profiles according to Weber SerpoVent facade system
Wind protection and thermal insulation ISOVER OL33-FACADE, joints to be taped with FACADE sealing tape. At the wall bottom, if necessary, ISOVER Mouse Strip Weber SerpoVent U brackets and fastening according to Weber SerpoVent facade system.
Cold bridges caused by the facade system are taken into account separately according to the bracket system.
Load-bearing reinforced concrete wall, according to structural design
Surface treatment according to room description

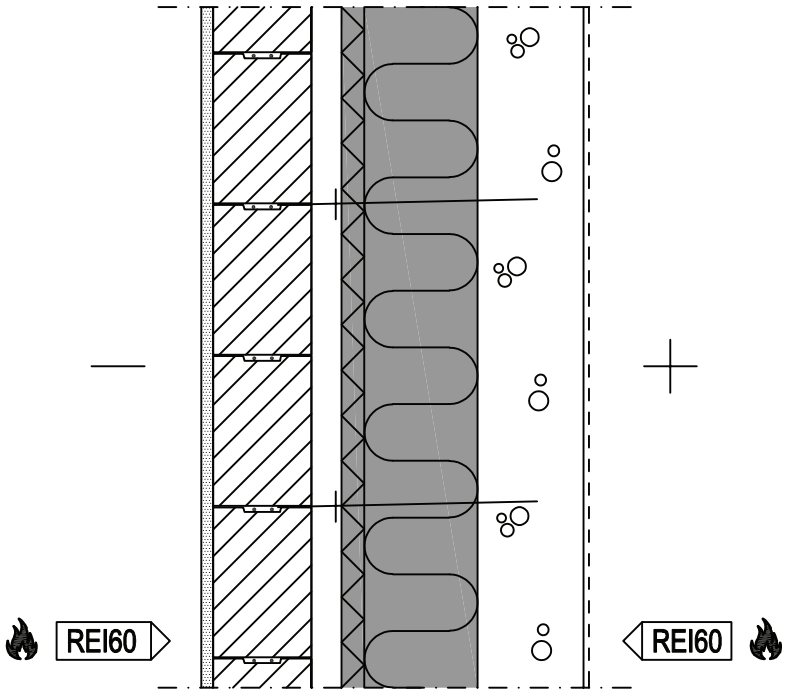
Fire resistance class REI60
Heat transfer coefficient ((thermal conductivity used in calculation λ_d)
U value 0.6 W/m^{2}K (Cold bridges caused by U brackets are considered separately)

Heat transfer coefficient

VERSION	INSULATION LAYER	U VALUE	REI ext/int
A	ISOVER OL-33 FACADE 205mm	U = 0.16	60/60
B	ISOVER OL-33 FACADE 180mm	U = 0.18	60/60

U value correction term $\Delta U=\Delta U_f$ =0.0051 W/m^{2}K, RST brick ties 4-6 pcs/m^2 through insulation layers.
Fire load contained in insulation < 12 MJ/m^2.

Construction site	Contents	**Heated space external wall, reinforced concrete frame, outer leaf**
Designer	Work n:o	**US 3201A**
	Date	



STRUCTURE FROM EXTERIOR TO INSIDE

Plastered Kahi Facade block, Kahi brick or baked brick, brick ties acc. to structural design

40 mm Ventilation gap

30 mm Wind protection and thermal insulation ISOVER FACADE, joints to be taped

150 mm Thermal insulation ISOVER EXTREME 31

Load-bearing reinforced concrete wall, according to structural design

Surface treatment according to room description

Sound-proofing capacity R_w ~52dB

Fire resistance class REI60

Heat transfer coefficient ((thermal conductivity used in calculation λ_d)

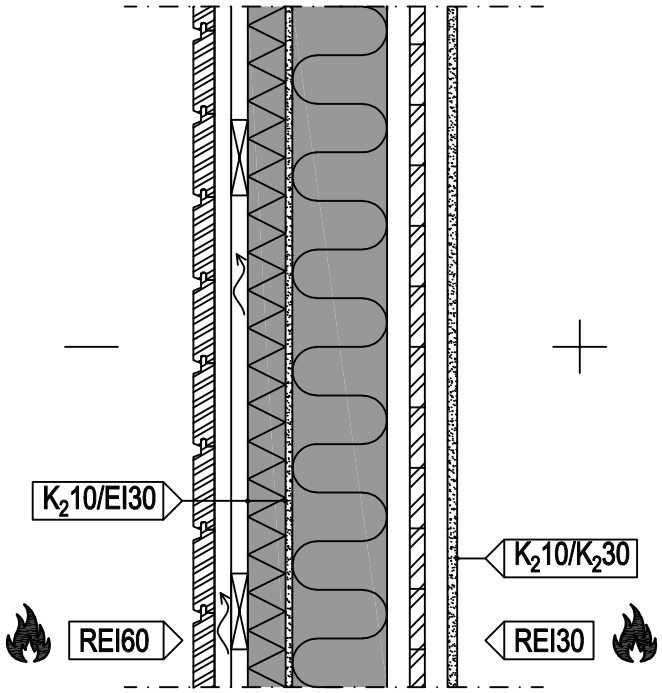
U value 0.17W/m²K

Heat transfer coefficient

VERSION	INSULATION LAYER	U VALUE	REI ext/int
A	ISOVER EXTREME 31150 mm + ISOVER FACADE 30 mm	U = 0.17	60/60
B	ISOVER PREMIUM 33150 mm + ISOVER FACADE 50 mm	U = 0.16	60/60

U value correction term $\Delta U=\Delta U_f$ =0.006 W/m²K, RST brick ties 4 pcs/m² through insulation layers..
Fire load contained in insulation < 12 MJ/m².

Construction site	Contents	**Heated space external wall, CLT solid timber frame, weatherboard cladding**
Designer	Work n:o	**US 8101**
	Date	



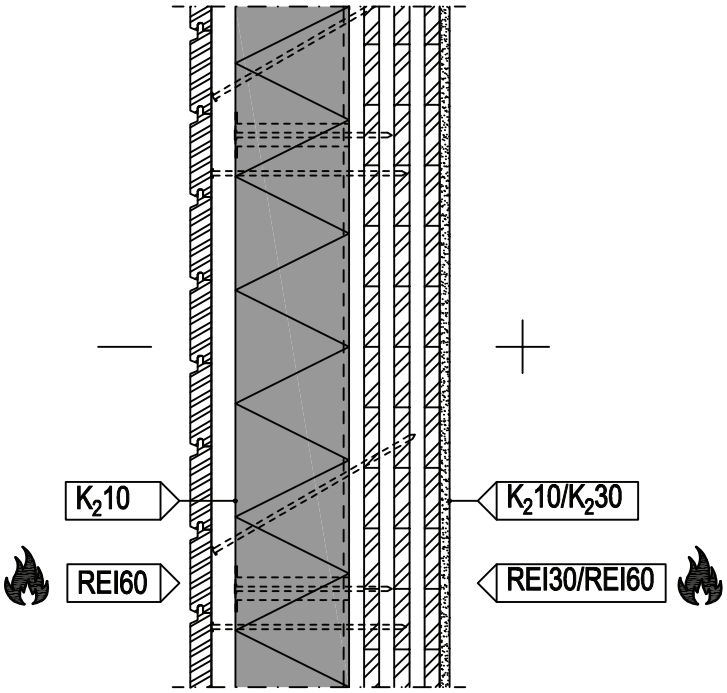
	STRUCTURE FROM EXTERIOR TO INSIDE
28 mm	External cladding
44 mm	Ventilation gap and cross-battening 22x100 ctrs600
50 mm	Wind protection and thermal insulation ISOVER FACADE, joints to be taped
9 mm	Plasterboard Glasroc GTX 9
123 mm	Thermal insulation ISOVER PREMIUM 33 and battening 48x123 ctrs600
	Moisture equalising ISOVER VARIO ® Xtra vapour barrier film, joints to be taped with ISOVER VARIO Multitape SL
	Load-bearing frame, cross-laminated solid timber - CLT element, here 80 mm
13/18 mm	Plasterboard GYPROC GEK13 or GYPROC GFL18(REI30/$K_2$30)
	Surface treatment according to room description

Fire resistance class REI30 / REI60 according to sheeting and charring rating

VERSION	INSULATION AND BOARD LAYERS	U VALUE	REI ext/int	THICKNESS (mm)
1	FACADE 50 mm+GTX9+PREMIUM 125 mm+GEK13	U = 0.17	60/-	347
2	FACADE 50 mm+GTX9+PREMIUM 175 mm+GEK13	U = 0.14	60/-	397
3	FACADE 50 mm+GTX9+PREMIUM 125 mm+GFL18	U = 0.17	60/30	352
4	FACADE 50 mm+GTX9+PREMIUM 175 mm+GFL18	U = 0.14	60/30	402

Heat transfer coefficient correction term ΔU < 3% from U value (EN 6946). No need to correct the U value.
Fire load contained in insulation < 12 MJ/m^2.

Construction site	Contents	**Heated space external wall, CLT solid timber frame, weatherboard cladding**
Designer	Work n:o	**US 8102**
	Date	



STRUCTURE FROM EXTERIOR TO INSIDE

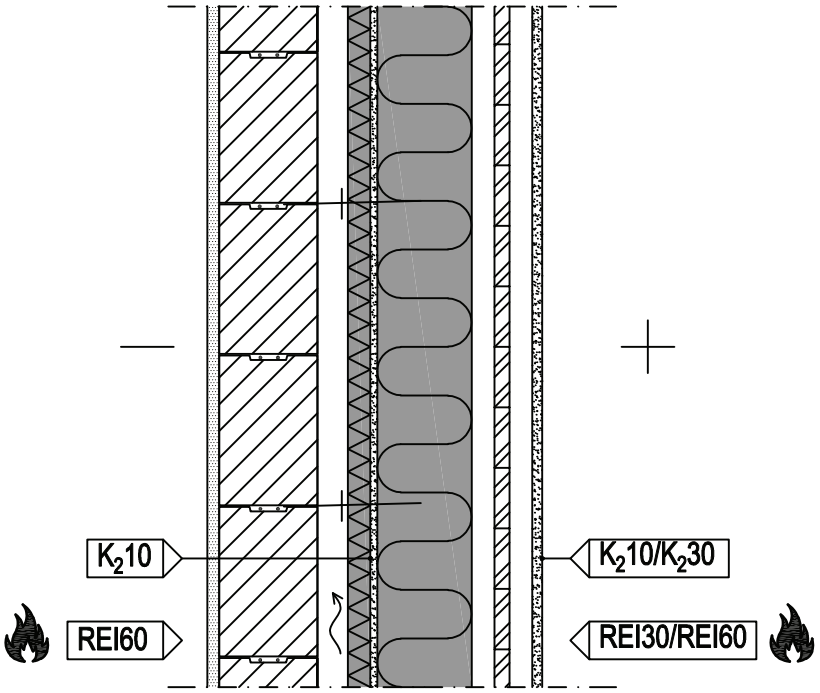
28 mm	External cladding
32 mm	Ventilation gap and vertical battening 32x100 ctrs600
150/180 mm	Wind protection and thermal insulation ISOVER OL-33 FACADE Installation according ISOVER FACADE system.
	Moisture equalising ISOVER VARIO ® Xtra vapour barrier film, joints to be taped with ISOVER VARIO Multitape SL
	Load-bearing frame, cross-laminated solid timber - CLT element, here 120 mm
13/18 mm	Plasterboard GYPROC GEK13 (REI30/$K_2$10) or GYPROC GFL18 (REI60/$K_2$30)
	Surface treatment according to room description

Fire resistance class REI30 / REI60 according to sheeting and charring rating
U value 0.17 W/m²K / 0.18 W/m²K (U value correction term $\Delta U=\Delta U_g$ =0.010 W/m²K)

VERSION	INSULATION AND BOARD LAYERS	U VALUE	REI ext/int	THICKNESS (mm)
1	FACADE OL-33150 mm + GEK13	U = 0.17	60/30	343
2	FACADE OL-33180 mm + GEK13	U = 0.15	60/30	373
3	FACADE OL-33150 mm + GFL18	U = 0.17	60/60	348
4	FACADE OL-33180 mm + GFL18	U = 0.15	60/60	378

Heat transfer coefficient correction term ΔU < 3% from U value (EN 6946). No need to correct the U value.
Fire load contained in insulation < 12 MJ/m².

Construction site	Contents	**Heated space external wall, CLT solid timber frame, brick cladding**
Designer	Work n:o	**US 8201**
	Date	



STRUCTURE FROM EXTERIOR TO INSIDE

Plastered Kahi Facade block, Kahi brick or baked brick, brick ties acc. to structural design

40 mm Ventilation gap

30/50 mm Wind protection and thermal insulation ISOVER FACADE, joints to be taped

9 mm Plasterboard Glasroc GTX 9

123/148 mm Thermal insulation ISOVER EXTREME 31 and battening 48x123 ctrs600

Moisture equalising ISOVER VARIO ® Xtra vapour barrier film, joints to be taped with ISOVER VARIO Multitape SL

Load-bearing frame, cross-laminated solid timber - CLT element, here 80 mm

13 mm Plasterboard GYPROC GN 13 or GEK13

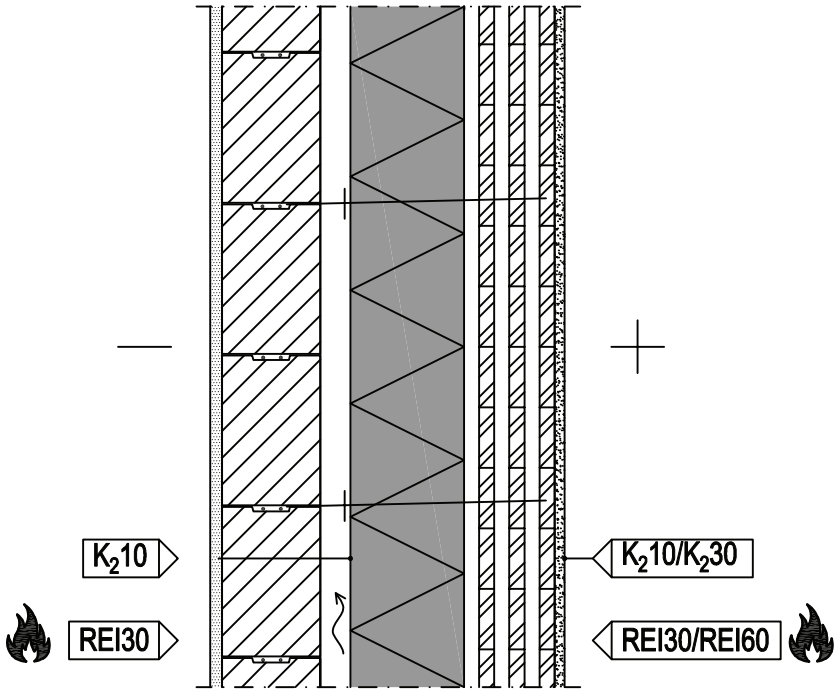
Surface treatment according to room description

Fire resistance class REI30 / REI60 according to sheeting and charring rating

VERSION	INSULATION AND BOARD LAYERS	U VALUE	REI ext/int	THICKNESS (mm)
1	FACADE 30 mm+GTX9+EXTREME 125 mm+GEK13	U = 0.17	60/	350
2	FACADE 50 mm+GTX9+EXTREME 150 mm+GEK13	U = 0.14	60/	395
3	FACADE 30 mm+GTX9+EXTREME 125 mm+GFL18	U = 0.17	60/30	355
4	FACADE 50 mm+GTX9+EXTREME 150 mm+GFL18	U = 0.14	60/30	400

Heat transfer coefficient correction term ΔU < 3% from U value (EN 6946). No need to correct the U value.
Fire load contained in insulation < 12 MJ/m^2.

Construction site	Contents	**Heated space external wall, CLT solid timber frame, brick cladding**
Designer	Work n:o	**US 8202**
	Date	



STRUCTURE FROM EXTERIOR TO INSIDE

Plastered Kahi Facade block, Kahi brick or baked brick, brick ties acc. to structural design

40 mm Ventilation gap

150/180/205mm Wind protection and thermal insulation ISOVER OL-33 FACADE, joints to be taped

Moisture equalising ISOVER VARIO ® Xtra vapour barrier film, joints to be taped with ISOVER VARIO Multitape SL

Load-bearing frame, cross-laminated solid timber - CLT element, here 120 mm

13/18 mm Plasterboard GYPROC GEK13 ($K_2$10) or GYPROC GFL18 ($K_2$30)

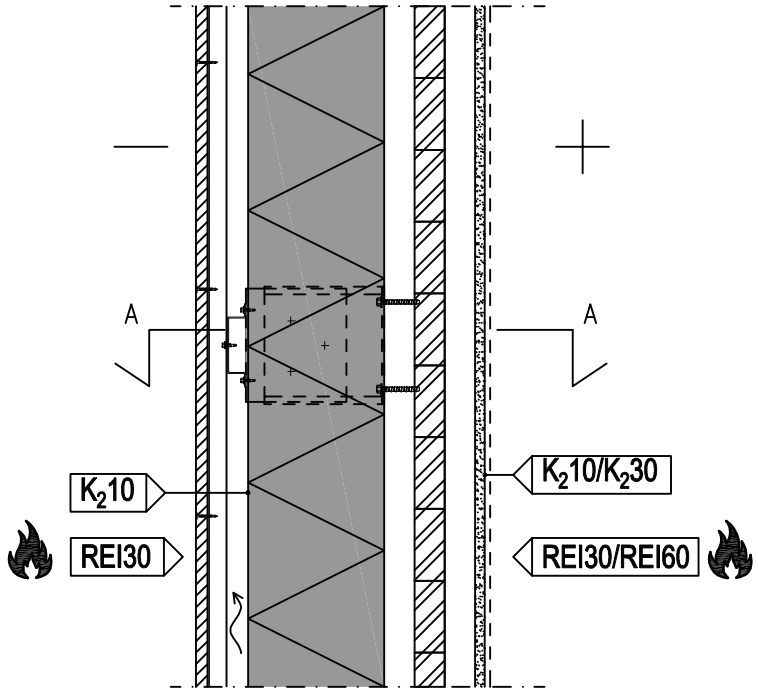
Surface treatment according to room description

Fire resistance class REI30 / REI60 according to sheeting and charring rating

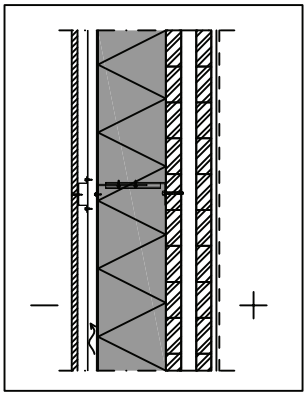
VERSION	INSULATION AND BOARD LAYERS	U VALUE	REI ext/int	THICKNESS (mm)
1	FACADE OL-33150 mm + GEK13	U = 0.17	30/30	458
2	FACADE OL-33180 mm + GEK13	U = 0.15	30/30	488
3	FACADE OL-33 205 mm + GEK13	U = 0.13	30/30	513
4	FACADE OL-33150 mm + GFL18	U = 0.17	30/60	463
5	FACADE OL-33180 mm + GFL18	U = 0.15	30/60	493
6	FACADE OL-33 205 mm + GFL18	U = 0.13	30/60	518

Heat transfer coefficient correction term ΔU < 3% from U value (EN 6946). No need to correct the U value.
Fire load contained in insulation < 12 MJ/m^2.

Construction site	Contents	**Heated space external wall, CLT solid timber frame, ventilated facade**
Designer	Work n:o	**US 8301**
	Date	



Section A - A



STRUCTURE FROM EXTERIOR TO INSIDE

Ventilated facade cladding, Permabase renderboard 12.5mm + SerpoVent two-coat plasterwork

Ventilation gap and steel profiles according to Weber SerpoVent facade system

150/180/205mm Wind protection and thermal insulation ISOVER OL33-FACADE, joints to be taped with FACADE sealing tape.

At the wall bottom, if necessary, ISOVER Mouse Strip Weber SerpoVent U brackets and fastening

according to Weber SerpoVent facade system. Cold bridges caused by the facade system are taken into account separately

according to the bracket system.

Moisture equalising ISOVER VARIO ® Xtra vapour barrier film, joints to be taped with ISOVER VARIO Multitape SL

Load-bearing frame, cross-laminated solid timber - CLT element, here 120 mm

13/18 mm Plasterboard GYPROC GEK13 ($K_2$10) or GYPROC GFL18 ($K_2$30)

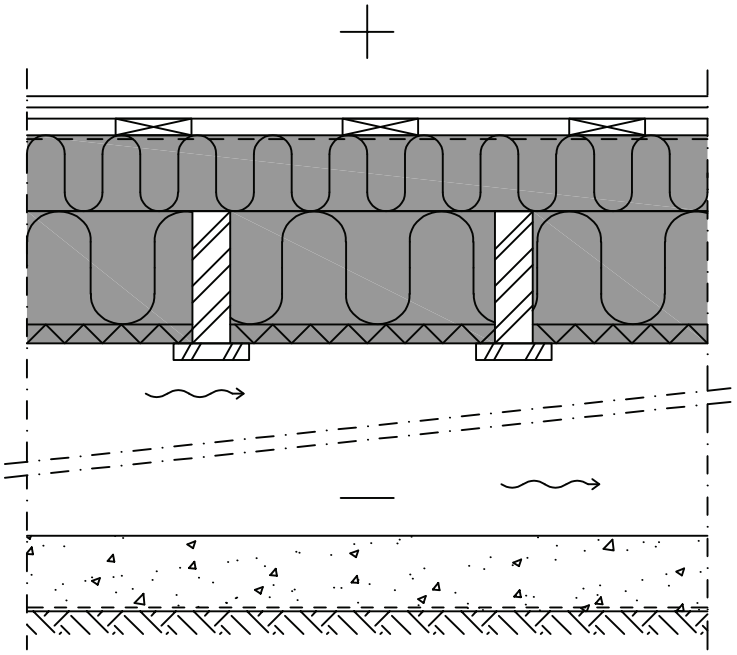
Surface treatment according to room description

Fire resistance class REI30 / REI60 according to sheeting and charring rating

VERSION	INSULATION AND BOARD LAYERS	U VALUE	REI ext/int	THICKNESS (mm)
1	FACADE OL-33150 mm + GEK13	U = 0.17	30/30	353
2	FACADE OL-33180 mm + GEK13	U = 0.15	30/30	383
3	FACADE OL-33 205 mm + GEK13	U = 0.13	30/30	408
4	FACADE OL-33150 mm + GFL18	U = 0.17	30/60	358
5	FACADE OL-33180 mm + GFL18	U = 0.15	30/60	388
6	FACADE OL-33 205 mm + GFL18	U = 0.13	30/60	413

Heat transfer coefficient correction term ΔU < 3% from U value (EN 6946). No need to correct the U value.
Fire load contained in insulation < 12 MJ/m^2.

Construction site	Contents	**Old base floor with crawl space, replacement of insulation and additional insulation on topside**
Designer	Work n:o	**AP 1.2**
	Date	



STRUCTURE FROM TOP DOWN

New structure:

Surface material and/or treatment

2x15 mm Gyproc GL15 floor plasterboard, board joints overlapping

22 mm Spaced boards 22x100mm ctrs300

Vapour barrier e.g. ISOVER VARIO ® Xtra

100 mm Battening 48x100mm ctrs600 + ISOVER PREMIUM 33

Old load-bearing structure ctrs400 + new ISOVER PREMIUM 33 insulation

25 mm ISOVER FACADE or ISOVER RKL-31 wind protection insulation

Old structure:

Support battening for thermal insulation

Ventilated crawl space

HEAT TRANSFER COEFFICIENT:

VERSION	INSULATION	U VALUE
A	ISOVER RKL-31 25 + PREMIUM 33150 mm + PREMIUM 33100 mm	0.15
B	ISOVER RKL-31 25 + PREMIUM 33175 mm + PREMIUM 33100 mm	0.14
C	ISOVER RKL-31 25 + PREMIUM 33200 mm + PREMIUM 33100 mm	0.13
D	ISOVER RKL-31 25 + PREMIUM 33150 mm + PREMIUM 3375 mm	0.17
E	ISOVER RKL-31 25 + PREMIUM 33175 mm + PREMIUM 3375 mm	0.16
F	ISOVER RKL-31 25 + PREMIUM 33200 mm + PREMIUM 3375 mm	0.15

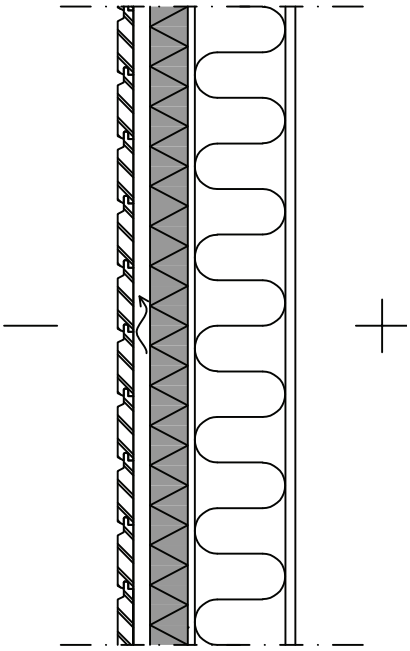
Note! U value calculated with 50mm broad floor supporters

Work instruction:

1. Remove old floorboards and spaced boards
2. Remove old vapour barrier film if any
3. Remove old insulation and place new ISOVER RKL-31 on the floor supporters
4. Place ISOVER PREMIUM 33 between the floor beams
5. Install new battening and new insulation ISOVER PREMIUM 33
6. Install new vapour barrier ISOVER VARIO with seams overlapping and tape them
7. Install the spaced boards and new Gyproc GL15 floor plasterboards or other flooring material

Note! U value corrected 0.01W/m²K (no uniform insulation layer)
The thermal and humidity behaviour of the structure must be investigated on a case-by-case basis

Construction site	Contents	**Additional insulation of old weatherboarded timber wall from outside**
Designer	Work n:o	**US1.1**
	Date	



STRUCTURE FROM INSIDE OUT:

Old structure:

Interior wallboard

Vapour-barrier film

Frame ctrs600

(Wind protection slab)

New structure:

50/75/100mm ISOVER FACADE

Battening ctrs600

Facade boarding

HEAT TRANSFER COEFFICIENT:

VERSION	INSULATION	U VALUE
A	Old wool 100 mm + ISOVER FACADE 50 mm	0.24
B	Old wool 100 mm + ISOVER FACADE 75 mm	0.20
C	Old wool 100 mm + ISOVER FACADE 100 mm	0.17
D	Old wool 125 mm + ISOVER FACADE 50 mm	0.21
E	Old wool 125 mm + ISOVER FACADE 75 mm	0.18
F	Old wool 125 mm + ISOVER FACADE 100 mm	0.16

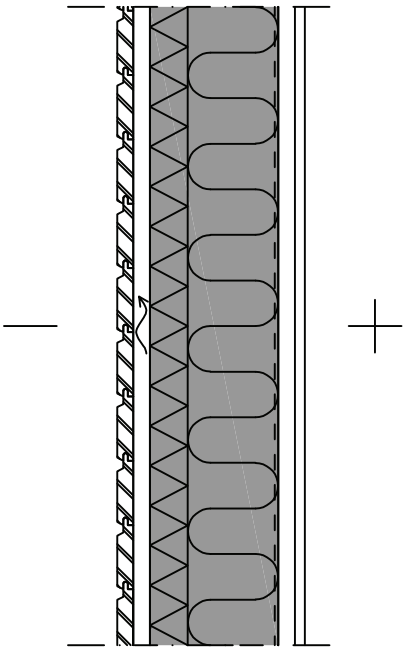
Note! The lambda value used for the old wool 0.040 W / mK
Note! U value calculated with 50mm broad frame studs

Work instruction:

1. Remove old external cladding and battening Check the condition of the wind protection product
2. Old wind protection in good condition can be left in place, otherwise remove the wind protection
3. Attach a new combined wind protection and thermal insulation slab ISOVER FACADE, using nail spacers
4. Tape the ISOVER FACADE seams
5. Attach a batten to the frame at the nail spacers
6. Attach the external cladding to the battening

The thermal and humidity behaviour of the structure must be investigated on a case-by-case basis

Construction site	Contents	**Additional insulation of old woodchip-insulated timber wall from outside**
Designer	Work n:o	**US2.1**
	Date	



STRUCTURE FROM INSIDE OUT:
Old structure:
Interior cladding
Diagonal boards
Vapour barrier, air barrier or similar
New structure:
Old frame ctrs600 and new insulation ISOVER PREMIUM 33
50/75/100mm ISOVER FACADE, combined wind protection and thermal insulation slab.
Batten ctrs600
Facade cladding

Heat transfer coefficient

VERSION	INSULATION LAYER	U VALUE
A	ISOVER PREMIUM 33100 mm + ISOVER FACADE 50 mm	0.22
B	ISOVER PREMIUM 33100 mm + ISOVER FACADE 75 mm	0.19
C	ISOVER PREMIUM 33100 mm + ISOVER FACADE 100 mm	0.16
D	ISOVER PREMIUM 33125 mm + ISOVER FACADE 50 mm	0.19
E	ISOVER PREMIUM 33125 mm + ISOVER FACADE 75 mm	0.17
F	ISOVER PREMIUM 33125 mm + ISOVER FACADE 100 mm	0.15

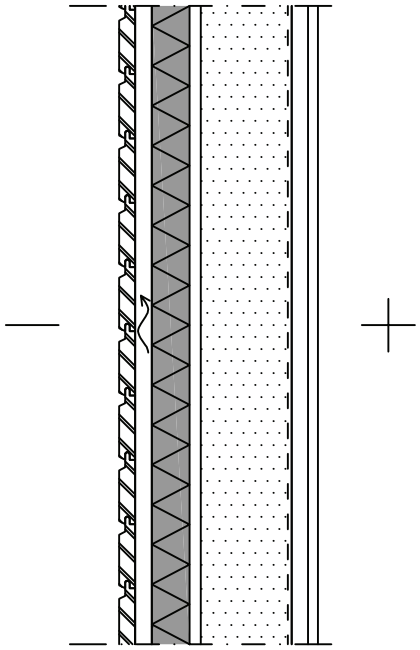
Note! Values calculated with 50mm broad frame studs

Work instruction:

1. Remove the old external cladding boards, battening and wall lining
2. Remove also the old diagonal boards and old woodchips Note! Ensure that the structure is stiffened with sufficient diagonal boards or a metal rim
3. Replace the old woodchip insulation with ISOVER PREMIUM 33 insulation
4. Attach a new combined wind protection and thermal insulation slab ISOVER FACADE, using nail spacers
5. Tape the ISOVER FACADE seams
6. Attach a batten to the frame
7. Attach the new external cladding boards to the battening

The thermal and humidity behaviour of the structure must be investigated on a case-by-case basis

Construction site	Contents	**Additional insulation of old woodchip-insulated timber wall from outside**
Designer	Work n:o	**US2.2**
	Date	



	STRUCTURE FROM INSIDE OUT:
	Old structure:
	Interior cladding
	Diagonal boards
	Vapour barrier, air barrier paper or similar
100 mm	Frame ctrs600 and woodchip insulation
	Air barrier paper or similar
	Diagonal boards
	New structure:
25...100mm	ISOVER FACADE, combined wind protection and thermal insulation slab
	Batten ctrs600
	Facade cladding

Heat transfer coefficient

VERSION	INSULATION LAYER	U VALUE
A	ISOVER FACADE EJ 25mm + old woodchip	0.43
B	ISOVER FACADE 30 mm + old woodchip	0.40
C	ISOVER FACADE 50 mm + old woodchip	0.32
D	ISOVER FACADE 75 mm + old woodchip	0.25
E	ISOVER FACADE 100 mm + old woodchip	0.21

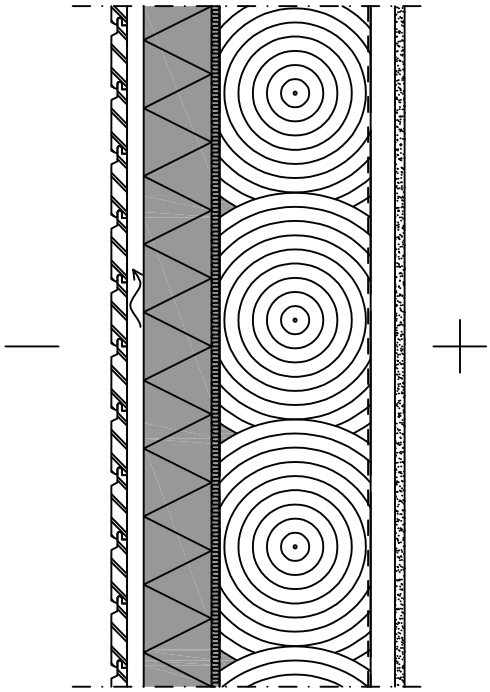
Note! Values calculated with 50mm broad frame studs

Work instruction:

1. Remove the old external cladding boards, battening and wall lining
2. Make sure that the gaps between the diagonal boards do not lead to the outside air. The gaps can be plugged with mineral wool at the ends, for example.
3. Attach a new combined wind protection and thermal insulation slab ISOVER FACADE, using nail spacers An ISOVER KH mineral wool mat can be installed as a base to even out wall irregularities.
4. Tape the ISOVER FACADE seams
5. Attach a batten to the frame
6. Attach the new external cladding boards to the battening

The thermal and humidity behaviour of the structure must be investigated on a case-by-case basis

Construction site	Contents	**Additional insulation of old log wall from outside**
Designer	Work n:o	**US3.1**
	Date	



STRUCTURE FROM INSIDE OUT:

New structure:

Plasterboard GYPROCGEK13

Vertical battening 32x100 ctrs600

Vapour barrier, e.g. ISOVER VARIO ® Xtra

Old structure:

Log frame

New structure:

15mm ISOVERKH

50/75/100 Wind protection wool ISOVER FACADE, seams taped

Battening ctrs600

External cladding

HEAT TRANSFER COEFFICIENT:

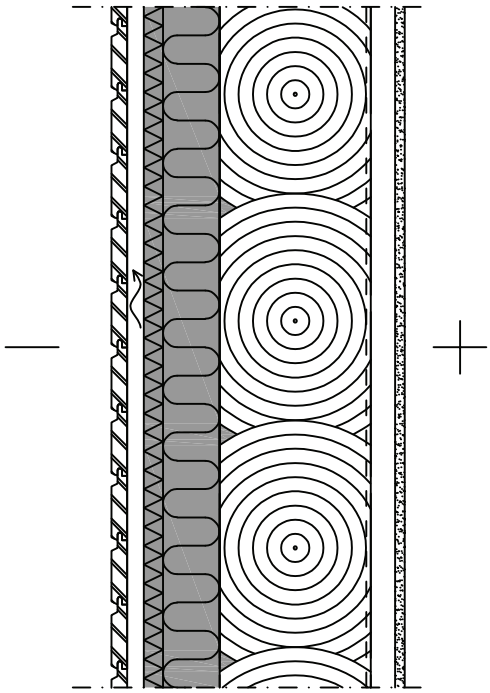
VERSION	INSULATION	U VALUE
A	ISOVER FACADE 100 mm + Log 180 mm	0.21
B	ISOVER FACADE 75 mm + Log 180 mm	0.25
C	ISOVER FACADE 50 mm + Log 180 mm	0.31
D	ISOVER FACADE 100 mm + Log 140 mm	0.22
E	ISOVER FACADE 75 mm + Log 140 mm	0.27
F	ISOVER FACADE 50 mm + Log 140 mm	0.34

Work instruction:

1. Remove old external cladding if any and battening
2. Plug big gaps and cracks by installing ISOVER KH insulation
3. Attach the FACADE product to the log frame using nail spacers
4. Tape the FACADE product seams
5. Attach a batten ctrs600 to the log frame
6. Attach the external cladding boards to the battening
7. Install the vapour barrier, vertical battening and interior wallboard on the log frame surface

The thermal and humidity behaviour of the structure must be investigated on a case-by-case basis

Construction site	Contents	**Additional insulation of old log wall from outside**
Designer	Work n:o	**US3.2**
	Date	



STRUCTURE FROM INSIDE OUT:
New structure:
Plasterboard GYPROCGEK13
Vertical battening 32x100 ctrs600
Vapour barrier, e.g. ISOVER VARIO ® Xtra
Old structure:
Log frame
New structure:
15mm ISOVERKH
Battening ctrs600 + thermal insulation ISOVER PREMIUM 33
3050 mm Wind protection wool ISOVER FACADE, seams taped
Battening ctrs600
External cladding

HEAT TRANSFER COEFFICIENT:		
VERSION	INSULATION	U value
A	Log 180 mm + ISOVER PREMIUM 33100 mm + ISOVER FACADE 50 mm	0.18
B	Log 180 mm + ISOVER PREMIUM 33 75 mm + ISOVER FACADE 50 mm	0.20
C	Log 180 mm + ISOVER PREMIUM 33100 mm + ISOVER FACADE 30 mm	0.23
E	Log 140 mm + ISOVER PREMIUM 33100 mm + ISOVER FACADE 50 mm	0.19
F	Log 140 mm + ISOVER PREMIUM 33 75 mm + ISOVER FACADE 50 mm	0.21
G	Log 140 mm + ISOVER PREMIUM 33100 mm + ISOVER FACADE 30 mm	0.21
H	Log 140 mm + ISOVER PREMIUM 33 75 mm + ISOVER FACADE 30 mm	0.24

Work instruction:

1. Remove old external cladding if any and battening
2. Plug big gaps and cracks with glass wool
3. Attach the battening ctrs600 to the log frame
4. Insulate the battening with the ISOVER PREMIUM 33 product
5. Tape the ISOVER FACADE seams
6. Attach a batten ctrs600 to the battening
7. Attach the external cladding boards to the battening
8. Install the vapour barrier, vertical battening and interior wallboard on the log frame inner surface

The thermal and humidity behaviour of the structure must be investigated on a case-by-case basis

The attached details show the indicative structural junctions of buildings of fire protection class P3 for timber frame and solid timber structures with ISOVER Facade system products and ISOVER insulation.
The details are also applicable to P2 fire protection class sites by considering the fire performance requirements for the fire protection class and the site (requirements for structural partitioning, surface class and protective cladding requirements, fire prevention in vents and cavities, etc.) in accordance with Decree 848/2017 of the Ministry of the Environment.

The structural interface details in the appendix are so-called indicative general cross sections, they do not take a position on e.g. fastenings, structural strengths, etc. Site-specific solutions and structure types are always determined by the site›s structural designer according to the site›s requirements. The exact dimensions of the structural layers and the performance values of the structural layers are determined in the structure types. Variables depending on the dimensions and performance of the structural layers are:

- Load-bearing capacity and stability of the structure
- Building physical functioning of the structure as a whole
+ water vapour permeability, air tightness, thermal conductivity, weather resistance of the materials
- Achievable level of thermal insulation
- Fire compartmentability (EI) and fire endurance (R) of the structure
- Fire resistance class of the materials (inflammability, smoke development, flammable drops)
- Fireproofing class of the surface layers of the structure for the background structure in the event of a fire
- Sound insulation level of the structure against traffic and aircraft noise (R'w + C ja R'w + Ctr)

General cross sections of new wooden structures:

1a. PL: US,rr - AP,mv
1b. PL: US,mp - AP,mv
2a. PL: US,rr - AP,rt
2b. PL: US,mp - AP,rt
3a. PL: US,rr - AP,vt
3b. PL: US,mp - AP,vt
4a. PL: US,rr - VP
4b. PL: US,mp - VP
5a. PL: US,rr - YP,s
5b. PL: US,mp - YP,s
6a. PL: US,rr - YP,v
6b. PL: US,mp - YP,v
7a. PL: US,rr — Window
7b. PL: US,mp — WINDOW
8a. VL US,rr - UN
8b. VL US,mp - UN
9a. VL US,rr - US,rr
9b. VL US,mp - US,mp

General cross sections of wooden renovation structures:

10a. PL: US - AP,mv
10b. PL: US - AP,mv
10c. PL: US - AP,mv
10d. PL: US - AP,vt
11a. PL: US - YP,v

Abbreviations:

US	=	Exterior wall
AP	=	Base floor
VP	=	Intermediate floor
YP	=	Roof slab
rr	=	Timber frame
mp	=	Solid timber
mv	=	Ground-supported
rt	=	Crawl space
vt	=	Freely ventilated
v	=	Slanting roof slab
s	=	Straight roof slab
UN	=	Outer corner
PL	=	Vertical section
VL	=	Horizontal section

Structure types with performance values can be found and downloaded from: www.isover.fi/rakennekirjasto

See also:
- ISOVER Facade -System Instructions, chapters 1-9 and Appendix 1. Structure types.
- Plasterboard and metal frame products www.gyproc.fi ja Gyproc -käsikirja: https://pages.nordic.saint-gobain.com/2021-FIN-Gyproc-kasikirjan-lataus.html
- Fillers, plasters, coatings and water insulations www.fi.weber
- LECA blocks and balls www.leca.fi
- Laskentapalvelut.fi: www.laskentapalvelut.fi/index_for_JRF.php

Renovation

The Facade system can be used to improve the properties of exterior cladding as well as in renovation. External additional thermal insulation effectively improves the structure›s thermal insulation performance with a uniform λ_0 0.031 W/mK thermal insulation layer.Energy consumption is reduced and the sound insulation of the structures is improved. In addition to the exterior wall structure, it is equally important to take care of the base floor and roof slab thermal insulation and tightness, and the condition of windows and doors. In the same way, the junctions of structural components must be implement tightly, without cold bridges and air leaks.

The inner surface (warm side) of envelope structures must be airtight and sufficiently water vapour tight. The insulation must be installed in the insulation space carefully filling without gaps. The outer surface of the envelope structure must be windproof, resistant to moisture stress from the outside air and efficiently permeable to water vapour. In addition, a uniform heat-insulating wind protection slab provides additional protection, especially for timber frame structures. ISOVER Facade forms wind protection which is rain and wind resistant, but effectively passes water vapour out of the structure.

A prerequisite for additional thermal insulation on the outside of the structure is that the existing structure is always in good condition. In principle, damaged parts must be replaced and the cause of the damage must be determined and repaired. For example insulation that has been damaged by moisture or rotten timber parts of the frame are often the result of air leaks in the internal surface of the structure, inadequate vapour barrier, or even the penetration of external moisture into the structure.

The RIL 107-2012 publication specifies the water vapour resistance required from the vapour barrier of an envelope structure insulated with open-cell insulation for buildings of different humidity classes, as well as the minimum values of the water vapour resistance ratio of the vapour barrier and wind protection for different wind protection materials. The traditional rule of thumb has been that in an envelope structure insulated with open-cell thermal insulation, the water vapour resistance of the inner surface of a water vapour barrier must be at least 5 times greater than the water vapour resistance of the outer surface wind protection. This is an absolute minimum and in many cases a much higher water vapour resistance is required on the inner surface. In addition, the air/steam barrier must be intact and tight, as even a small hole is an open leakage point through which significantly more moisture passes locally into the structure than what diffuses through an intact vapour barrier. In addition, contaminants can enter the indoor air through leaks. Air leaks also cause a feeling of draught and there is no precondition for ventilation to work as planned. Ventilation must take place through the supply and exhaust air ducts - not through structures or structural junctions!

Additional thermal insulation of an old timber frame structure from the outside with Facade wind protection insulation slabs

The exterior cladding of the old exterior wall is dismantled up to the existing wind protection slab, or the diagonal boards. If the base is in good condition, any unevenness is levelled with the ISOVER KH wool mat before installing the Facade wind protection insulation slabs, so that cold outside air cannot pass between the new additional thermal insulation and the old structure. Otherwise, installing Facade slabs on top of the old base shall follow the same installation instructions as for new buildings (mounting, sealing, etc.) It is important for the functioning of the structure to ensure that the old frame structure, insulation and vapour barrier are properly installed and in good condition. An RKL starting profile is installed at the bottom of the Facade slab if the Facade slab crosses the plinth line. The starting profile protects the insulation from birds and rodents An ISOVER mouse strip is installed at the bottom of the ventilation gap of the new timber cladding.

The exterior wall with a timber frame can also be further insulated from the inside, or from the inside and outside. Especially if the old wall insulation and/or the vapour barrier are in poor condition, they should be replaced. In this case, the structure is dismantled from the inside and the old insulation is replaced with new one. The thermal insulation of the wall is significantly improved already by renewing the frame insulation. For example, replacing woodchip insulation with ISOVER PREMIUM thermal insulation almost halves the wall›s heat transfer coefficient (U value) in a typical woodchip-insulated exterior wall structure of a ‹veteran›s› house.

A new air and vapour barrier is attached to the inner surface of the frame. A safe choice for dry interiors is the ISOVER Vario® Xtra moisture equalising vapour barrier. Another option is to use ISOVER InLiner (AluLiner in saunas and wet rooms). Inliner is a 25 mm thick, sturdy and efficient (λ_0 0.031 W/mK) thermal insulation slab with an ISOVER Vario vapuor barrier film pre-attached to the inside surface.AluLiner, on the other hand, has an aluminium coating on the inside surface.Both renovation slabs are installed against each other in the butt without battening, the seams are taped according to the Vario® system. For example, a 25x100 battening is installed inside the InLiner, which means that electrical wiring and repair boxes can be installed in the installation space on the interior wallboard without breaking the vapour barrier film.

Additional thermal insulation of an old log wall

Old log structures differ in many ways from today›s log structures. The logs were carved from a single tree, so that the thickness and profile of the log differed from the current glued lamella logs.
In practice, the difference in log profiles is most pronounced in shrinking and swelling of structures, their sagging, tightness and thermal insulation. In old log buildings, air leaks could occur at the joints between the logs and in the cracks in the logs.

Thermal insulation of an old log structure can be safely improved by insulating the structure from the outside with a uniform water vapour-permeable ISOVER Facade wind protection insulation, on which a ventilated timber cladding is installed. Additional thermal insulation is usually applied on top of a levelling wool layer, as the log profile would leave air ducts that weaken the thermal insulation of the structure.Unevenness can be effectively smoothed with an ISOVER KH wool mat. Increasing the insulation usually requires adding an air barrier and interior cladding with sufficient water vapour resistance to the inner surface of the log structure. A safe choice is the so-called a hygroscopic film such as ISOVER Vario® Xtra Prior to further insulation, make sure that the old structure does not contain any tight coating that restricts the flow of water vapour. The structure to be insulated must have a clean wooden surface, or treated only with a coating/protective agent that is highly permeable to water vapour. The moisture performance of the structure must be checked by the designer, taking into account the existing structure and additional thermal insulation. A solid timber structure also acts independently as an air and vapour barrier when it is sufficiently thick and airtight.

In structures connected to log frame, the sagging of the wall must be taken into account!

Additional thermal insulation for a freely ventilated timber floor structure

An old base floor built on a timber-beam structure and with free ventilation is often insulated with either mineral wool or sawdust. The underside surface of the floor structure has an insulation-bearing cladding attached to load-bearing beams. The upper surface of the floor structure traditionally has a vapour/air barrier and floorboarding.

Prior to floor repairs, it is necessary to determine the condition of the entire base floor from the timber structures to the ground. The rain and runoff water of the environment must not end up under the building, and the capillary rise of moisture from the soil must be prevented. The condition of the foundations must be checked and, if necessary, repaired. No demolition waste must remain in the base floor and there must be sufficient ventilation between the floor structure and the ground, the entire base floor must be ventilated efficiently. The base floor penetrations must be carefully sealed.

The floor structure must be dismantled from the top.If the beams are in good condition and meet the load capacity requirements, they can be left in place. If necessary, the beams must be replaced with new ones or individual beams replaced / strengthened. Facade wind protection insulation slabs and slab support boards are installed on the underside of the beams. The boards must be treated with timber preservative. The joints of the Facade slabs are carefully sealed by taping.On top of the Facade slabs and between the beams ISOVER PREMIUM thermal insulation is installed, and the ISOVER Vario® Xtra moisture equalising vapour barrier on top of the beams before floorboarding/sheeting.

Storage of Facade packages

ISOVER Facade slabs are delivered from the factory in plastic packaging, in which they can be stored for a short time outdoors without separate covers, provided the packages are unopened and intact. Opened / broken packages should not be left exposed to rain or wind and should be stored in a sheltered room. It is never recommended to install any wetted insulation slabs in a structure until the insulation slabs have been thoroughly dried. Longer-term storage of Facade packages should be done in a weather-protected room or carefully protected with separate covers so that no water can accumulate on the cover. Likewise, packages must not be in contact with the ground or subject to splash water. The underside must be sloping away from the storage area and well ventilated.

Transport of prefabricated exterior wall elements

Facade slabs installed in prefabricated elements must be installed (fastened and sealed) similarly as on site. It is recommended that the elements are transported to the construction site in a covered wagon or at least under a weather-protected hood. In addition, it is a good idea to have temporary protection taped from the Facade coating to the inside of the element on the top surface of the element to protect the top edge of the element from possible rain exposure during site operations. Facade slab seams and opening edges must be taped before transport, the joints of the prefabricated elements are taped/sealed on site in connection with the installation of the element The storage of elements on site must be carried out in such a way that the Facade insulation is not exposed to more intense weathering than when installed in the final application in accordance with these system instructions. It is important to protect the open edges of the Facade slabs at various stages of the supply chain. If the coating has come off a Facade slab, the damage can be patched on site, for example with the ISOVER SealStripe PROstrip.

Site installation

On the construction site, the Facade slabs should be installed from top to bottom, especially on higher facades, i.e. the installation should start from the eaves. This prevents rain exposure from affecting the open top edges of an unfinished Facade sheeting. It is especially important to tape the seams and edges of the Facade slabs at the outer corners as well as at the window and door openings at the same time as the installation progresses. It is recommended to install the facade as soon as possible, but no later than within 6 months from the installation of the Facade wind protection slabs.

Instructions for handling ISOVER insulation slabs

Immediate contact with the fibres may cause momentary itching.

Hoover the working area.

Ensure adequate ventilation.

Wear safety goggles when installing products above your head.

Rinse with cold water before washing.

Wear protective clothing. Wear a respirator when working in an unventilated space!

Dispose of waste according to local regulations.

Fastening of ISOVER Facade wind protection slabs in the backside of ventilated exterior claddings

1. Timber cladding - to a timber frame

- ISOVER nail spacers are used with Facade 25, 30 and 50 mm slabs. The spacer prevents the battening from being pressed into the insulation. At the same time, they act as a support during the installation of Facade panels before the installation of the ventilation strips, when the wall is being sheeted vertically (on site). The spacers are installed with an interval of approx. 600 mm at the frame studs. In loaded areas of emergency exits, ladders, etc. spacers must be installed with a ctrs300 interval. Ventilation battens are mounted on the spacers and fastened with screws when the Facade slab is more than 30mm thick. Alternatively, nails can be used to fasten the 25 and 30 mm Facade spacers.

- With a Facade EJ slab, a spacer may not be required for horizontal installation (at a prefabricated panel factory) because the EJ slab is particularly rigid and stronger than other Facade slabs. At the construction, it may be justified to use a spacer site with EJ, as the slabs must in any case be fastened to the wall before the ventilation battens can be attached.

- ISOVER Termofix spacers are used with Facade 50, 75 and 100 mm slabs. They are fastened with the screws and the fastening tool included in the Termofix package. The ventilation battens are fastened to the background timber structure next to the spacer with a screw. The spacers must be installed below the ventilation batten with an interval of approx. 600 mm and at a frame stud.

  For thicker OL-33 Facade slabs (120, 150 and 180 mm), 50 mm diameter ISOVERTermofix spacers are used in timber facades and frame structures. They are fastened with the screws and the fastening tool included in the package. The ventilation battens are fastened next to the spacer with a screw. The fastening of the battening is carried out according to a separate plan.

- ISOVER nailing plates and nails/screws are sufficient for attaching Facade plates only. The fasteners are attached at ca. 600 m interval. The consumption of brackets is 4-8 pcs/m^2 depending on the plate size.

2. Timber cladding - lightweight concrete frame

- As for fastening to a timber frame, the brackets for the battens must be screws for lightweight concrete suitable for the background material.

3. Brick cladding - to concrete/timber frame

- With brick cladding, ISOVER brick ties and counter-plates are used to fasten the insulation and to tie the brickwork to the frame. Brick ties are available for timber, concrete and LECA block frames.

4. Renderboarding - to concrete/timber frame

- Ventilated renderboarding can be implemented in accordance with the Weber Serpovent PRO1 system.
  In the background of the renderboards, sheet metal capping strips are installed, which enable efficient ventilation and a strong background structure. The capping strips are attached to the frame structure with Serpovent brackets. The brackets are attached to the frame structure with suitable fasteners in accordance with the Serpovent system instructions.

Saint-Gobain Rakennustuotteet Oy

Fastening and use of Termofix spacers

The spacer is screwed into the Facade insulation slab with a screwdriver. The screwdriver tip included in the ISOVER Termofix package is inserted into the screw head inside the spacer and the spacer with its fixing screws is drilled through the Facade slab.

The fixing screw inside the spacer sinks into the wooden base and at the same time pushes the spacer against the base. You should not overtighten the fixing screw, it is sufficient that the spacer engages against the base. The spacer fixing screw holds the spacer and the Facade slab in place. Facade battens are fastened with longer screws next to the Termofix spacer.The heads of the fixing screws securing the ventilation battening are rotated flush with the surface of the ventilation battening, so that they press the entire structure firmly against the base.

Termofix spacers are not installed on a non-grooved plate joint or right on the edge of the slab. The spacer is best drilled through the Facade coating and insulation when its distance from the edge of the slab is at least equal to the diameter of the spacer.

This should be taken into account when positioning the Facade slabs in relation to the frame studs. At the bottom and top of the wall it is possible to use a thick battening support strip/scantling for the insulation, or a sheet metal profile, in which case the first the spacer is about 600 mm from the bottom and top edge of the slab when the battening rests on the support scantlings and are attached to them.

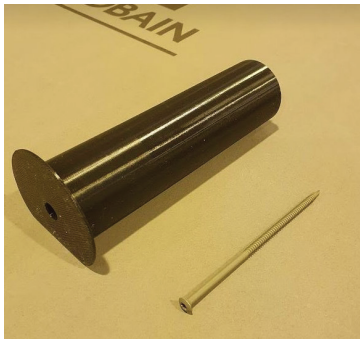
The spacers are installed under each ventilation battens (ctrs ≤ 600 mm) against the Facade slab at intervals of approx. 600-700 mm, depending on the thickness of the ventilation battening and the weight of the facade. So the consumption is about 3 pcs/m^2.

The ISOVER Termofix spacers are made of polypropene.

ISOVER nailing spacer

ISOVER nailing plate

ISOVER Termofix+ package



The Termofix spacer contains a fastening screw, the insulation slabs can be fastened to the frame with Termofixes, the ventilation battens are fastened with a separate screw next to the Termofix.

BRICK TIE THR

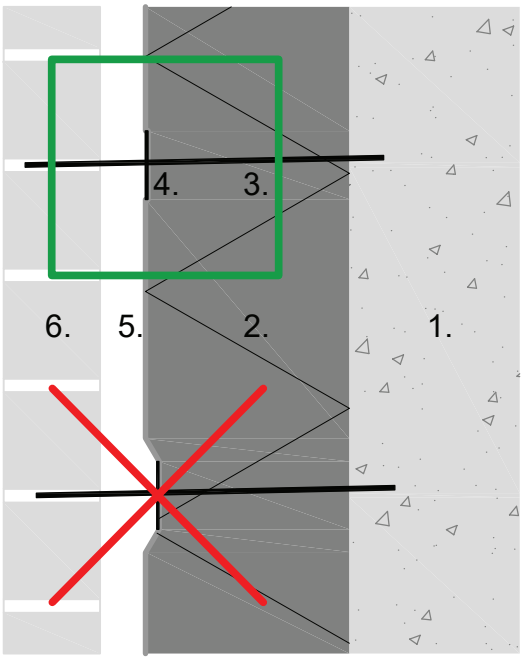
BRICK BRACKET TS

LOCKWASHER VLR

COUNTER PLATE VLM 60 mm

Construction site	Contents	FASTENING INSTRUCTIONS FOR ISOVER FACADE INSULATION BOARDS 3/3
ISOVER Saint-Gobain Rakennustuotteet Oy	03.	
APPENDIX 2: FACADE - SYSTEM INSTRUCTIONS GENERAL	Date 08.10.2021	Attachment of ISOVER OL-33 Facade to the frame on the backside of a masonry facade
	revision	

A



B

COUNTER PLATES AND LOCKWASHERS SHOULD BE MOUNTED ON THE FACADE SURFACE LEVEL (see installation A)

DO NOT PRESS INTO INSULATION (see installation B)

1. Frame
2. ISOVER OL-33 Facade
3. Brick tie TH / THR + brick bracket TS / Brick bracket TLP
4. Counter plate VLM 60 mm + Lockwasher VLR 32x40 mm / 32x60 mm
5. Ventilation gap
6. Masonry facade

The brick ties TH and THR are intended to be attached to concrete-block frames. At the end of the ties there is a wedge anchor that attaches to the frame with a 40 mm deep hole to be drilled with a stopper drill. The brick tie TH is intended for small and terraced houses (max. 3 floors), while THR is also suitable for taller buildings together with brick brackets that allow vertical movement. A loop-end brick tie TLP can be used with more porous frame materials (max. floors) together with fasteners suitable for the frame material.

Brick ties are suitable for use in structures with one or two layers of thermal insulation. In single-layer thermal insulation solutions we use wind-protection coated rigid ISOVER Facade slabs, or thicker semi-rigid OL-33 Facade slabs. In two-layer thermal insulation solutions, an uncoated ISOVER insulation wool slab (e.g. PREMIUM) can be installed as thicker thermal insulation against the building frame, and on top of it thin (e.g. 30 mm thick) rigid ISOVER wind protection slabs.

ISOVER thermal insulation is installed tightly against the frame by pressing the insulation through the brick ties and locking it in place using the counter plates (VLM) and lockwashers (VLR). The ISOVER OL-33 Facade slabs are softer than the thinner than Facade slabs and excessive force should be avoided when installing lockwashers to keep the surface of the OL-33 Facade as smooth/intact as possible. This makes it easy to seal the joints of the wind protection slabs properly and the finished uniform result meets the requirements for wind protection.

In small and terraced houses of fire protection class P3, plastic ISOVER RKL brick ties can also be used together with a max. 60 mm thick ISOVER RKL-31 glass felt-coated insulation slabs.

INSTRUCTION FOR FASTENING TIMBER FACADE VENTILATION BATTENS TO AN OL-33 FACADE INSULATED CLT-/LVL BOARD

Screw-anchoring of facade to a CLT board

1. Wind protection insulation ISOVER OL-33 Facade 120/150/180 mm
2. Termofix spacers ctrs ≤ 600 mm
3. Battening ≥ 32x100 ctrs ≤ 600 mm
4. Horizontal screws, stainless steel acc. to construction design
5. Diagonal screws, stainless steel acc. to construction design
6. Timber cladding fastened to battening
7. CLT/LVL solid timber board

NOTE! Screw type, length and diameter to be specified case by case.
- Thickness of insulation, battening and timber board
- Weight and wind load of facade
- Properties of the screws to be used

If the battening is fastened without Termofix spacers, full-thread screws (cylinder head) must be used in accordance with the screwing plan, so that the screw does not pull the board to be fastened inside the insulation.

The quality and quantity of the screws directly affect the wall›s corrected heat transfer coefficient Uc = U + ΔUf.

The effect of a single stainless steel 8 mm screw on the U-value per wall square metre:

CLT	ISOVER	U value	ΔUf
120 mm	OL 33 - 180 mm	0.147	0.0029

Example of the effect of screws on the U-value of a wall structure in the structure:

- ISOVER OL-33 Facade 180 mm (Λ_b 0.033 W/mK)
- CLT 120 mm (Λ_d 0.11 W/mK)
- Facade anchoring screws (Λ_d 20 W/mK)
  8 mm stainless screws on average ctrs 600 (in total ≤ 2.7 pcs/m²)

=> Structure›s U value without corrections = 0.1469 W/(m²K)
- Correction caused by fasteners ΔU_f = 0.0077 W/m²K

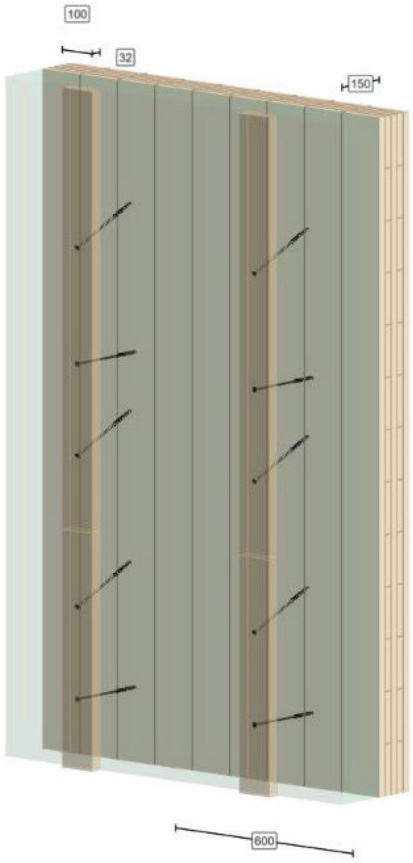
=> Corrected heat transfer coefficient Uc = U + ΔU_f = 0.15 W/m²K

Example of anchoring a timber-clad facade with Spax screws:

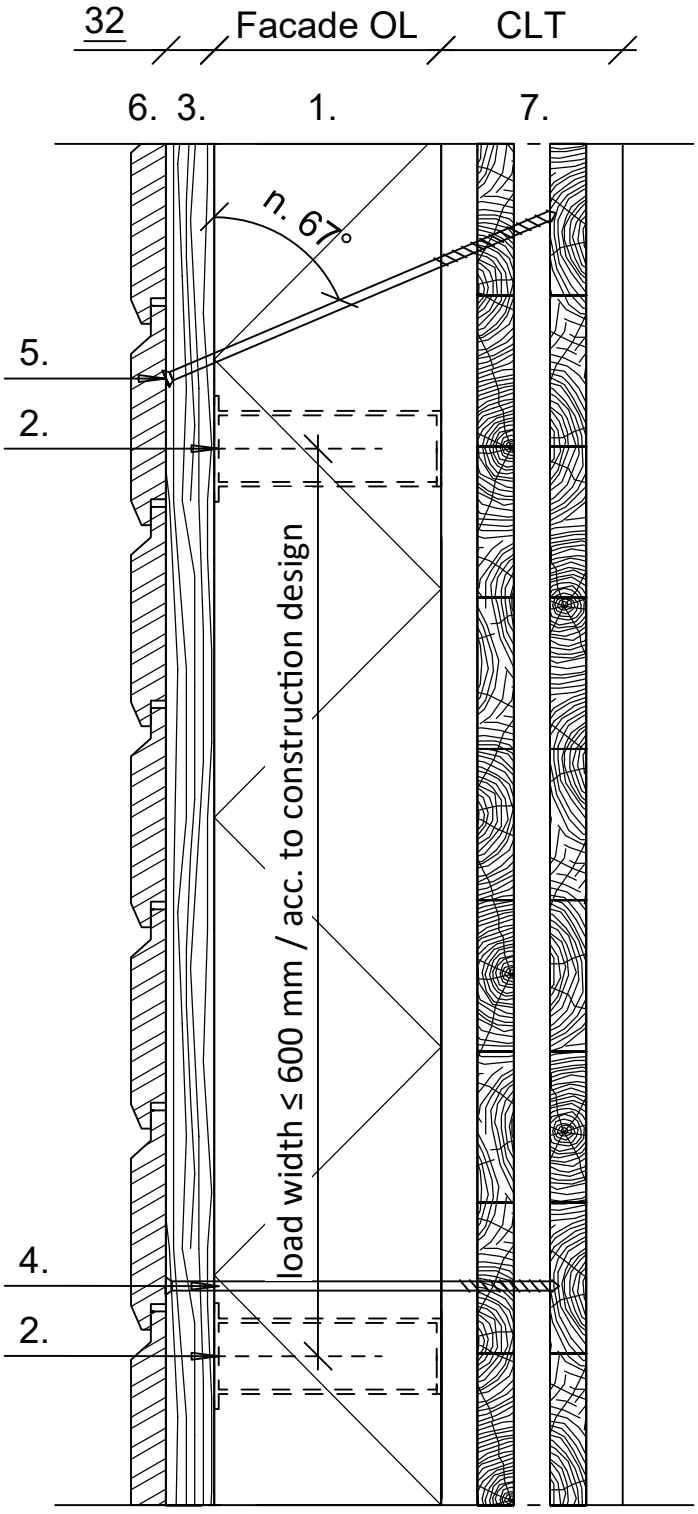
- Timber cladding, battening and insulation gk ≤ 0.25 kN/m2
- Wind load qk ≤ 0.8 kN/m2
- Facade battening 32x100 k600
- Screws Spax T-Star Plus
  + 8x280 low countersunk head, partial thread
  + A4 stainless steel
- ISOVER OL-33 Facade 180 mm
- ISOVER Termofix spacers next to screws
- CLT 120 mm
- Screw consumption ~ 2.7 pcs / wall-m2

=> Site-specific screwdriving plan in accordance with the Spax sizing program

Termofix spacer + fastening screw The spacer bores into the insulation, the insulation remains inside the spacer.



Illustrative 3D illustration of a screws



Sealing of ISOVER Facade slab seams and joints

The seams of the Facade slabs are taped IMMEDIATELY during the installation of the slabs. Facade and Vario tapes from the Facade system are used for all taping. Also the edges of the facade slabs which are open in corners and window and door junctions are closed with tape and/or 300 mm wide ISOVER Facade SealStrip made of Facade coating. SealStrip is attached to the base with Facade system tapes on both sides, SealStrip PRO has adhesive strips on both edges.

The surfaces to be taped must be clean and dry. Taping is also possible at a few degrees below zero, but in this case the tapes must be kept warm until taping and the surface to be taped must not be covered with frost. The protective paper is removed from the tape and the tape is carefully rubbed onto the surface to be sealed.

In cold and/or humid conditions, ISOVER Facade joint sealant intended for outdoor conditions can also be used to seal the slabs. It can even be applied on a slightly damp surface, or used at min. -10 degrees below zero as instructed. However, the surface must NOT be covered with frost. The sealant is applied to clean surfaces with the ISOVER Facade spreader head attached to the sealant tube. The spreader head has a rabbit which is placed in the slab seam, and the sealant is compressed when applied inside the seam and a thin strip about 20 mm wide is left on the slab surface. The sealant consumption is about 10 running metres/310 ml tube.

The 6-month performance guarantee of the Facade system on the external wall for UV and weathering requires that all slab joints are sealed and the open sides of the plates are carefully sealed with Facade system products.

Facade system tapes and sealing strips
+ ISOVER Facade Tape (60/90 mm),
+ ISOVER VARIO® Facade Tape (60 mm),
+ ISOVER Vario® MultiTape SL sealing tape
+ ISOVER VarioBond sealing strip (75/100 mm),
+ ISOVER Facade SealStrip and SealStrip PRO (300 mm), for the edges of thicker Facade slabs
+ Isover Facade sealant + spreader head

Sealing and vapour barrier tapes for ISOVER Facade wind protection slabs

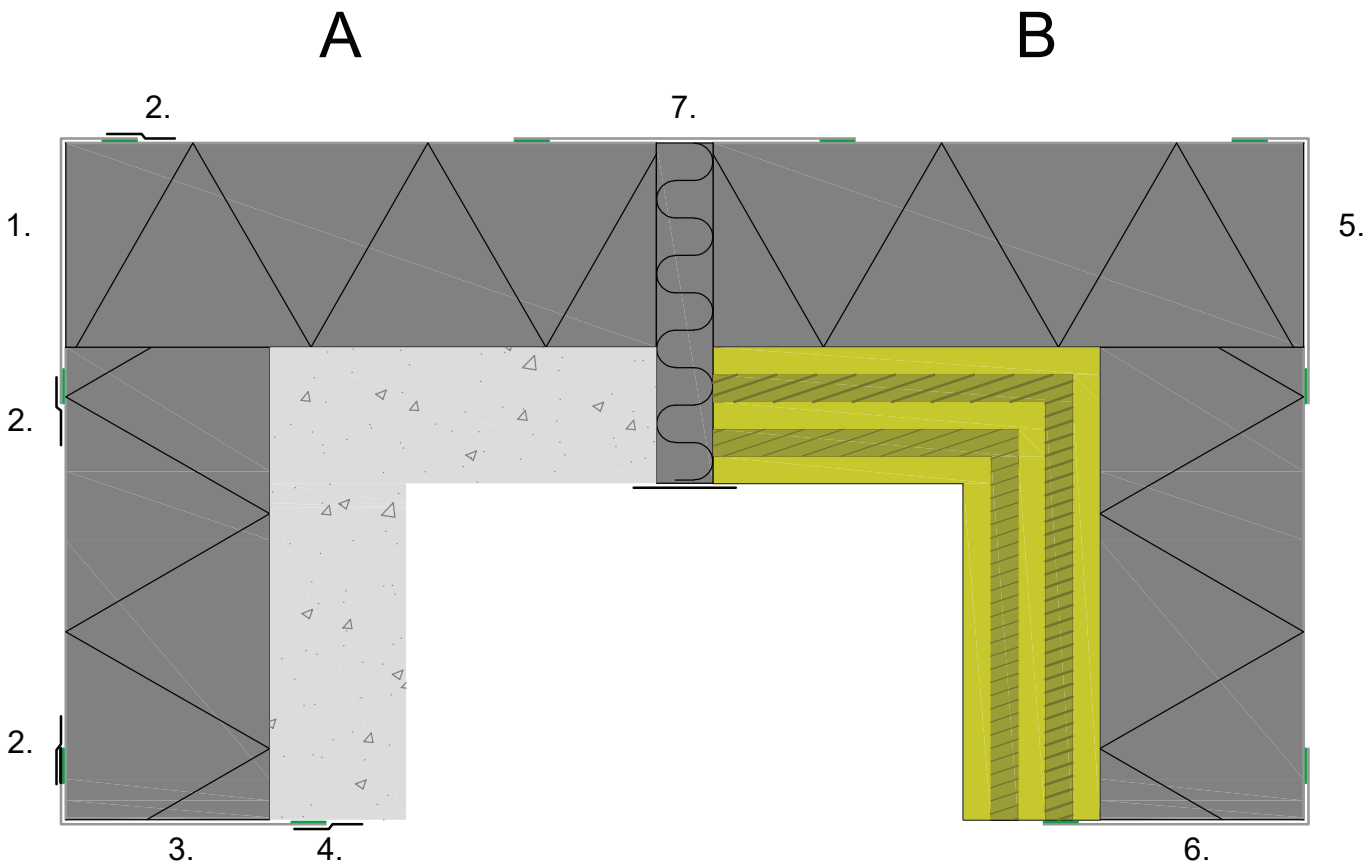
ISOVER FACADE / VARIO TAPES	Applications		Temperatures		Material and product data			
	Primary	Suitable also for	Use	Installation	Application	Widths (mm)	m/rll	Elasticity
ISOVER FacadeTape sealing tape	Facade joints	PA,PE,PU,PP,ALU, pap.	-40 - (+) 80°C	≥ -5°C	1-part	60, 90	50	Elastic
ISOVER VARIO® Facade Tape, black	Facade joints, demanding conditions					60	25	Elastic
ISOVER Facade Sealstrip	Facade edges corners, window and door junctions	With thicker Facade slabs	Acc. to fastening tape		-	300	40	Non-elastic
ISOVER Vario® MultiTape SL sealing tape	HS joints, bushings, frame and corner joints indoors and outdoors	Facade, paper, wood, metal	-40 - (+) 100°C	> -5°C	2-part	60	25	Elastic
ISOVER Vario® MultiTape SL Xtra Wide						150	20	Elastic
ISOVER VarioBond sealing strip	HS and Facade sealing in window and door frames, stone structures	Concrete, brick, wood PP, PA, PVC	-30 - (+) 100°C	+5 -> 40 °C	2-part	75,100	25	Non-elastic
ISOVER Vario® DoubleTwin 2-sided tape	HS fastening during installation instead of hooks, e.g. on metal	PE, pap, wood, glass, metal			1-part	19	25	Non-elastic
ISOVER Vario® KB1 sealing tape	HS joints	PA,PE,PU,PP,ALU, pap.	-30 - (+) 100°C	> -10 °C	1-part	60	40	Elastic
ISOVER Vario® Patch tape	HS patching, indoors and outdoors	Paper, wood, metal	-40 - (+) 100°C	> -5°C	2-part	240x250 pieces 104 pcs/rll		Non-elastic

HS= ISOVER VARIO, VapoBlock, PE vapour barrier films
Products not recommended for underlays!

ISOVER Facade SealStrip is a 300 mm wide strip made of Facade wind protection coating. The product is especially used for sealing the edges of OL-33 Facade, for example in external corners and window and door openings. Facade SealStrip is attached to the wind protection surface of the OL-33 Facade slab, e.g. with an ISOVER stapler, the final attachment to the joint surface is done with Facade sealing tape (Fig. A, point 2). In more challenging conditions and e.g. when attaching to concrete, it is recommended to prime with ISOVER FD Mounting Adhesive (Figure A, item 4).

ISOVER Facade SealStrip Pro is equipped with adhesive strips on the edges for easy installation. The mounting surface should be clean and dry, as usually when taping. Suitable mounting surfaces are Facade coating and e.g. smooth-surfaced wood (point 6 in Figure B). In the most challenging conditions and on surfaces, such as when attaching to concrete, it is recommended to prime with ISOVER FD Mounting Adhesive and/or in addition, the edge of the SealStrip Pro is fastened with the Facade tape to ensure durability. The adhesion of the SealStrip Pro adhesive strip to the corner joints is significantly improved by carefully folding the strip to a 90-degree angle. The distance between the joint edge and the fold also affects the adhesiveness (Fig. B, item 6).Folding and distance reduce the (opening) tension on the fresh glue joint.

Taping not possible on a frost-covered or moist surface. In addition, it must be ensured that the structure (concrete) is dry enough for taping.



1. ISOVER Facade SealStrip attached to OL-33 Facade coating on outer corner.
2. Facade tape
3. ISOVER Facade SealStrip attached to OL-33 Facade coating and concrete on outer corner.
4. If necessary, priming of the surface with ISOVER FD MOUNTING ADHESIVE and taping with Facade tape/Vario Bond tape.
5. ISOVER Facade SealStrip carefully folded and attached to OL-33 Facade coating on outer corner.
6. ISOVER Facade SealStrip carefully folded and attached to OL-33 Facade coating and solid timber board on opening edge.
7. ISOVER Facade SealStripe Pro straight joint.

ISOVER SK-C, KH and Vario® Plinth strip

ISOVER SK-C and KH, like Facade slabs, are made of glass wool, which is an inorganic and chemically neutral material and does not contain corrosive ingredients.The products are non-rotting and odourless and do not provide a suitable breeding ground for moulds. The products meet the emission class M1 for surface materials. ISOVER SK–C products are all-fibre-coated, silicone-treated and water-repellent glass wool strips. The most typical applications of ISOVER SK–C include the sealing of the installation gap between window and door frames and the joint insulation of frame structures as well as that of connecting wooden elements and battening. The SK-C stock product has a thickness of 20 mm and a roll length of 14 m. Stocked product widths are 90, 115, 140, 170, 200, 225 and 240 mm. The product is non-combustible, A2-s1, d0 class insulation, maximum operating temperature 200 ° C (depending on application).

ISOVER KH is an uncoated silicone-treated mineral wool mat. ISOVER KH is a non-combustible insulation and belongs to the best A1 fire resistance class ISOVER KH is used for various sealing purposes (windows and doors and gaps between logs, etc.) and for thermal insulation when the surfaces to be insulated are not smooth (e.g. log walls).

The ISOVER KH product is also available as pre-cut so-called strip products used e.g. for horizontal and vertical joints of concrete elements; the KH felt (width 1220 mm) available in thicknesses 8–50 mm. Available as a KH strip product (thickness 50 mm) in widths of 150, 200, 220, 240 and 260 mm The product is designed for the insulation of concrete sandwich elements.

ISOVER VARIO® Plinth strip is made of long-lasting EPDM cellular rubber, which makes it easy to make tight joints. The product acts as both a capillary barrier and an air seal between the sole plate and the foundation wall. The VARIO® Plinth strip is quick to install and the flexibility of the material and the longitudinal thickenings in it facilitate the installation work and ensure airtightness.

The thickness of the strip is 100 mm and the widths are: 100 mm, 150 mm, 170 mm and 200 mm. The VARIO® Plinth strip is part of the ISOVER VARIO® airtightness system, which together with other VARIO® products ensures the tightness of the vapour barrier film and helps to build moisture-proof and energy-efficient buildings.

ISOVER SK-C sealing strip

ISOVER KH mineral wool mat

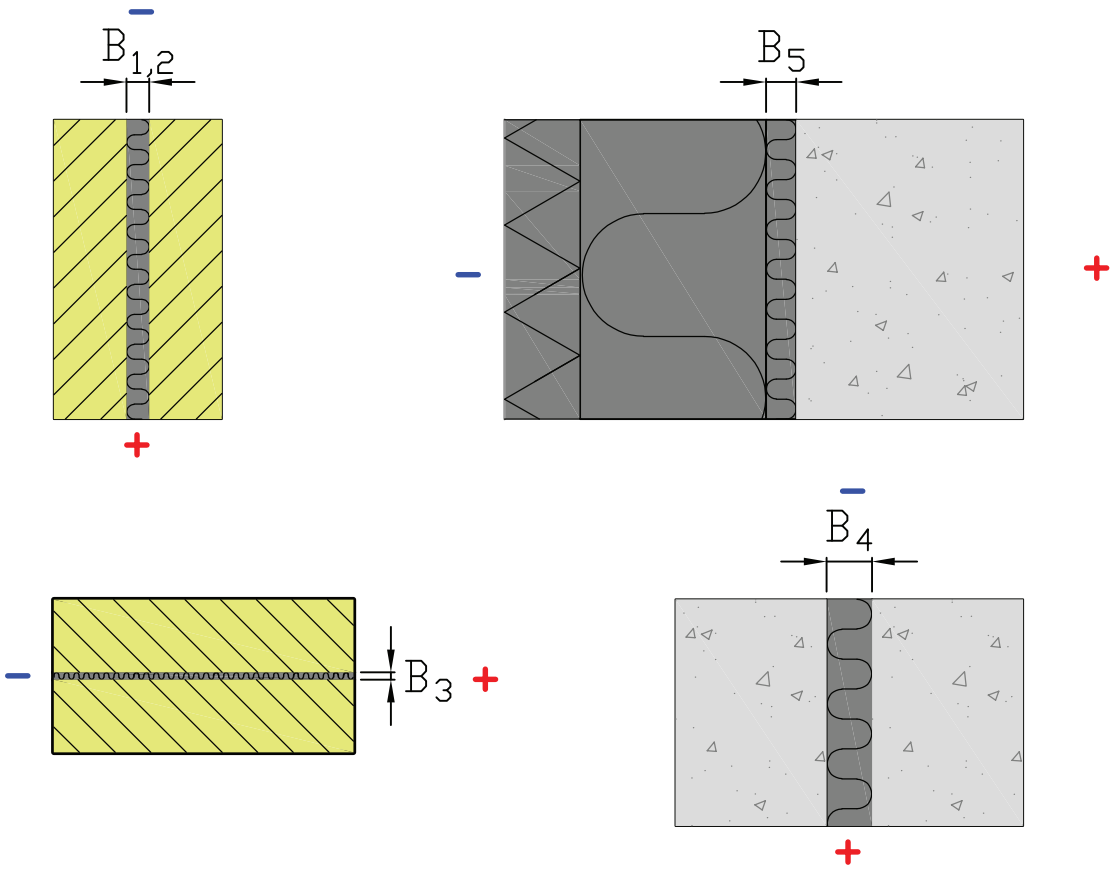
ISOVER VARIO® Plinth strip

Indicative design thicknesses for ISOVER glass mats and seam strips by seam type are shown in the table below. The thickness of the insulation is selected according to the joint gap to be insulated and the application. The insulation must fill the joint gap compressing appropriately In general, it is a good idea for the insulation to be about 50% thicker than the joint gap to be insulated, so that the material is thermally functional - for example, an insulation that is generally suitable for a gap of 10 mm is 15 mm thick. On large surfaces, excessive insulation thickness may make it difficult to install components/ elements or result in joint thicknesses exceeding the nominal size in element installations, while on uneven surfaces, too thin a joint strip will not insulate all points.

NOTE! ISOVER KH and SK/C joint strips are thermal insulation. The joints of structures, depending on the application, must be sealed further for air and water vapour tightness according to structural design.

Joint type	Joint distance (mm)		Product, thickness (mm)
Timber wall element end vertical joints Junctions between window/door frames and building frame	B1	10 15	KH 15 / SK-C 20 SK-C 20 / KH 30
Vertical joint between timber roof elements	B2	15 30	KH 30 (2 x SK-C 20) / KH 50
Adjacent studs, vertical joint Under the base plate of wall element, horizontal joint	B3	~3-5	KH 8 mm
Concrete element end vertical joints	B4	30 50	KH 50 / (KH 30 + KH 15) (KH 50 + SK-C/KH 20)
Vertical joint between concrete and timber elements in the direction element's slope	B5	30 50	KH 50 / KT* 50 (KH 50 + KH 20) / KT* 75

*) = ISOVER STANDARD ROLL

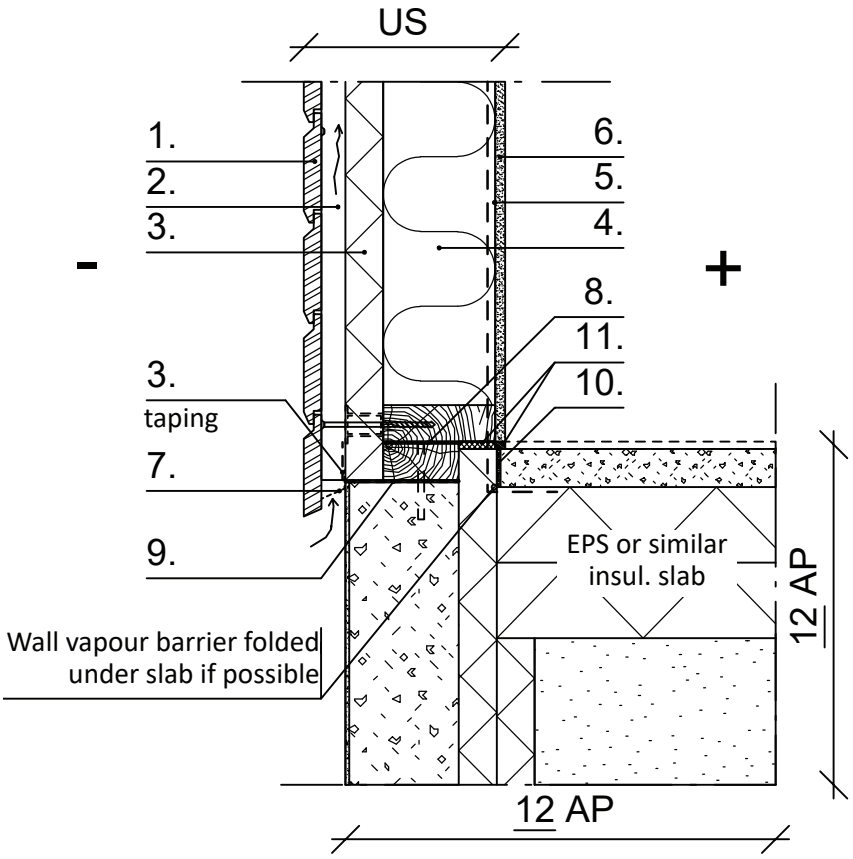


Construction site	Contents	EXTERNAL WALL AND BASE FLOOR JUNCTION CROSS-SECTION
Saint-Gobain Rakennustuotteet Oy	1a.	
APPENDIX 2: FACADE - SYSTEM INSTRUCTIONS NEWBUILD STRUCTURES	Date 08.10.2021	US,rr - AP,mv
	revision	

Glasroc GTX 9 wind protection slab between the Facade and frame, if the frame needs to be stiffened from the outside for example, for an internal fire situation.
Facade ≥ 50 mm + Glasroc GTX 9 correspond to structural part EI30.

(1) Exterior cladding panelling ≥ 21 mm
(2) Trussed battening ≥ 22x70
(3) Facade ≥ 30 mm / EJ 25 mm
(4) Frame thickness (+PREMIUM) 48x148/150 mm
(6) Gyproc GR 13
=> REI 60 for outside fire
=> REI 30 for internal fire, when also GTX 9.on outer surface
=> REI 60 for internal fire, when also GTX 9. and structural layer 6 on outer surface = Gyproc GFL 18.
=> Structure›s U value 0.17 W/m2K, if Facade ≥ 50 mm

see more detailed preconditions for fire engineering Gyproc & ISOVER fire structures from the table and the Gyproc manual!



1. External cladding
2. Battening / ventilated air gap
3. ISOVER Facade wind-protection coated thermal insulation
   - Joint sealing
     + ISOVER Facade Tape /
     + VARIO® - Facade Tape
     + ISOVER VarioBond sealing strip in joints to stone structures
   - RKL Termofix spacer under battening / Nail spacer
4. ISOVER PREMIUM 33 thermal insulation between balloon frame
5. ISOVER Vario® Xtra moisture equalising vapour barrier
   - Joint sealing
     + VARIO® Multitape SL tape /
     + VARIO® KB 1 - Sealing tape
6. Gyproc GEK 13
7. ISOVER mouse strip
8. ISOVER KH-8 mineral wool mat between plinth beam and frame sole plate.
9. ISOVER Vario® Plinth strip (moisture break + sealing strip)
   NOTE! Radon break to be installed if necessary
10. Weberfloor 4960 edge strips fo vertical structures
11. Elastic sealant under plasterboard, PU foam between plinth vertical insulation and frame sole plate

12. Plinth and base floor structure and foundation according to separate design

    - Under floor covering e.g. according to Weber floor solutions:
      + Werbervetonit 130 CORE Comfort Plaano + Weberfloor 4945 fibreglass mesh
      + Weberfloor 4940 separation fabric
      + Base floor insulation and gravel bedding

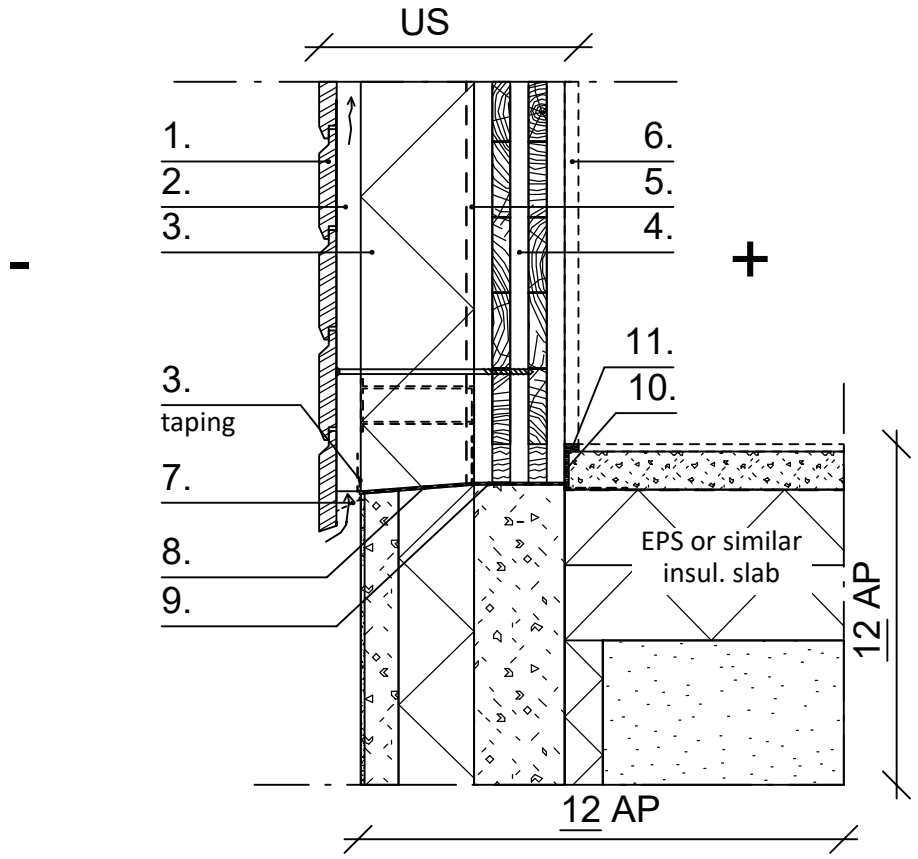
    - Plinth levelling and coating e.g. according to Weber plinth solutions

Construction site	Contents	EXTERNAL WALL AND BASE FLOOR JUNCTION CROSS-SECTION
Saint-Gobain Rakennustuotteet Oy	1b.	
APPENDIX 2: FACADE - SYSTEM INSTRUCTIONS NEWBUILD STRUCTURES	Date 08.10.2021 revision	US,mp — AP,mv

External surface fireproofing class is K2 10, if (3) Facade OL33 ≥ 120 mm.

Internal surface fireproofing class
K2 10, when (6) ≥ Gyproc 13 mm
K2 30, when (6) ≥ Gyproc GFL 18

Structure›s U value 0.17 W/m2K if
- effect of mechanical fasteners of external cladding battening is here < 3%
- insulation layer (3) ≥ 150 mm and CLT -levy (4) ≥ 120 mm.



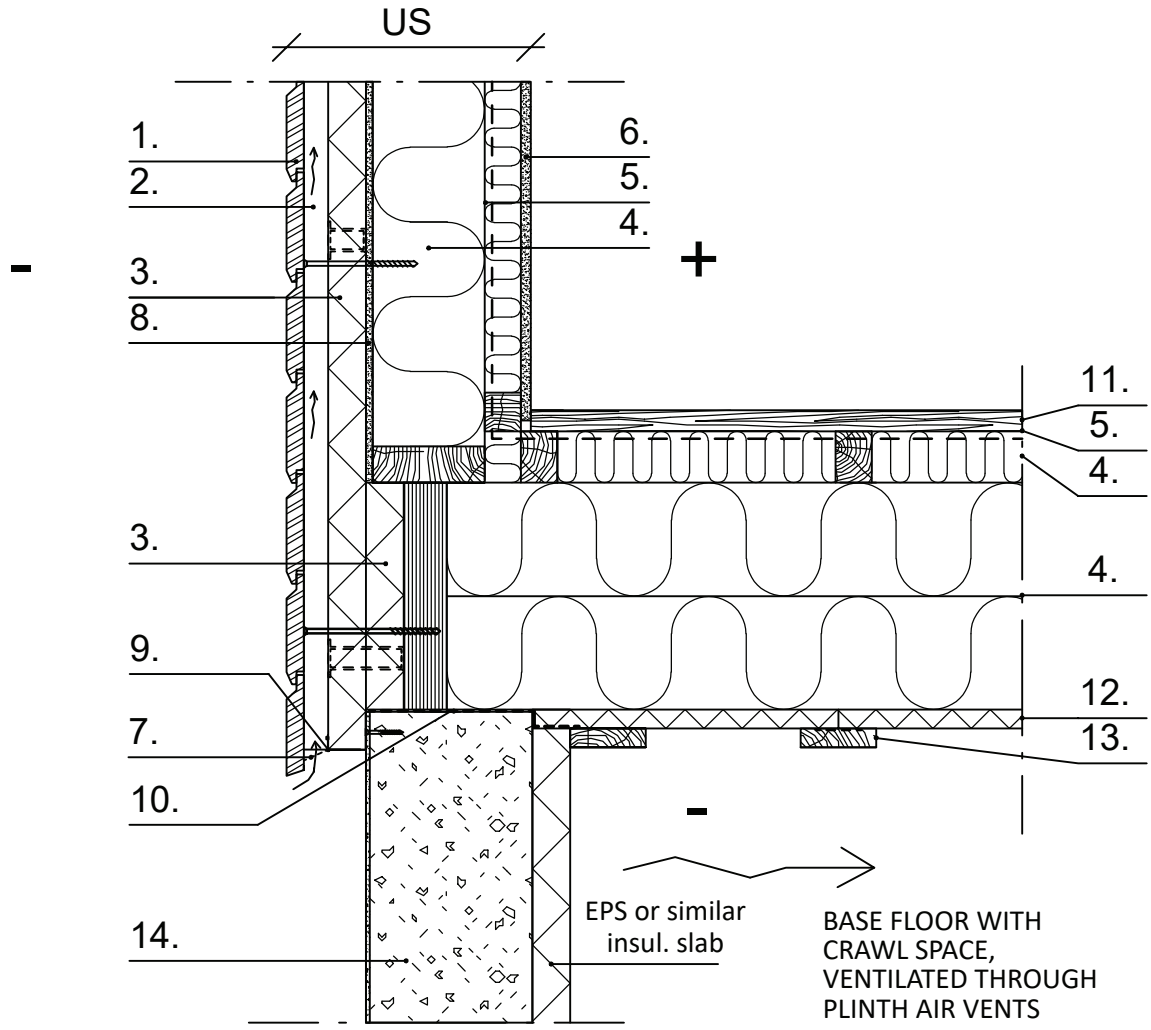
1. External cladding
2. Battening / ventilated air gap
3. ISOVER OL33 Facade wind-protection coated thermal insulation
   - Joint sealing
     + ISOVER Facade Tape /
     + VARIO® Facade Tape
     + ISOVER VarioBond sealing strip in joints to stone structures
   - RKL Termofix spacer under battening + fastening screws
4. Solid timber board CLT / LVL according to separate design
5. ISOVER Vario® Xtra moisture equalising vapour barrier if necessary
   - Joint sealing
     + VARIO® Multitape SL tape /
     + VARIO® KB 1 - Sealing tape
6. Gyproc GEK 13 if necessary
7. ISOVER mouse strip
8. Moisture break + ISOVER KH-8 if necessary
9. ISOVER Vario® Plinth strip (moisture break + sealing strip)
   NOTE! Radon break to be installed if necessary
10. Weberfloor 4960 edge strips fo vertical structures
11. Elastic sealant

12. Plinth and base floor structure and foundation according to separate design

    - Under floor covering e.g. according to Weber floor solutions:
      + Werbervetonit 130 CORE Comfort Plaano + Weberfloor 4945 fibreglass mesh
      + Weberfloor 4940 separation fabric
      + Base floor insulation and gravel bedding

    - Plinth levelling and coating e.g. according to Weber plinth solutions

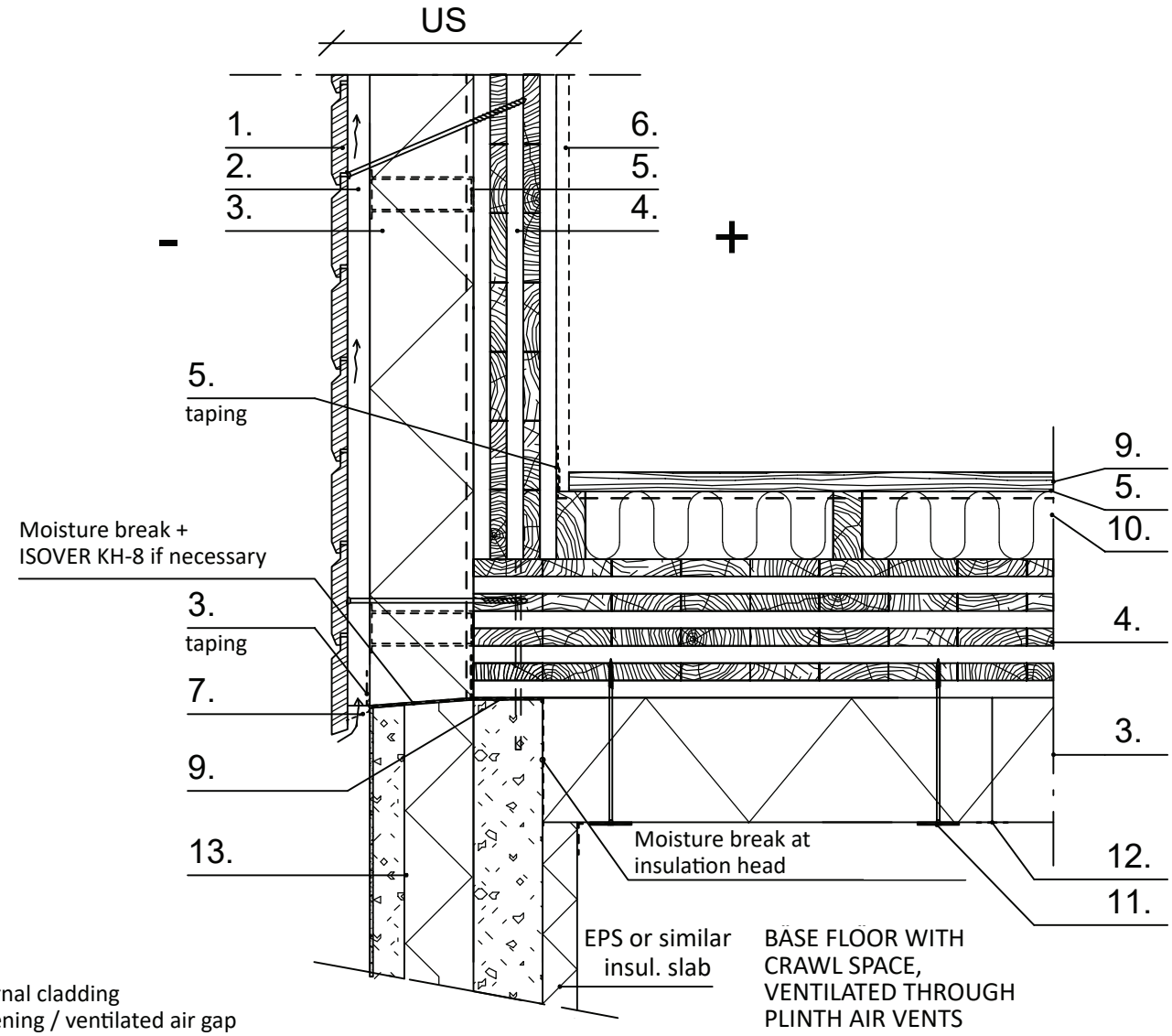
Construction site	Contents	EXTERNAL WALL AND BASE FLOOR JUNCTION CROSS-SECTION
Saint-Gobain Rakennustuotteet Oy	2a.	
APPENDIX 2: FACADE - SYSTEM INSTRUCTIONS NEWBUILD STRUCTURES	Date 08.10.2021 revision	US,rr - AP,rt



1. External cladding
2. Battening / ventilated air gap
3. ISOVER Facade wind-protection coated thermal insulation
   - Joint sealing
     + ISOVER Facade Tape /
     + VARIO® Facade Tape
     + ISOVER VarioBond sealing strip in joints to stone structures
   - RKL Termofix spacer under battening / Nail spacer
4. ISOVER PREMIUM 33 thermal insulation between balloon frame
5. ISOVER Vario® Xtra moisture equalising vapour barrier
   - Joint sealing
     + VARIO® Multitape SL tape /
     + VARIO® KB 1 - Sealing tape
6. Gyproc GEK 13
7. ISOVER mouse strip
8. Glasroc GTX 9
9. ISOVER starter profile
10. ISOVER Vario® Plinth strip (moisture break + sealing strip)
11. Floorboarding / sheeting
12. ISOVER Facade EJ
    - Joint sealing ISOVER Facade Tape / VARIO® Facade Tape
13. Support boards 22x100 (preservative treated) ctrs ≤ 600 and at joints of butted slabs

14. Plinth and base floor structure and foundation according to separate design
    - Plinth levelling and coating e.g. according to Weber plinth solutions

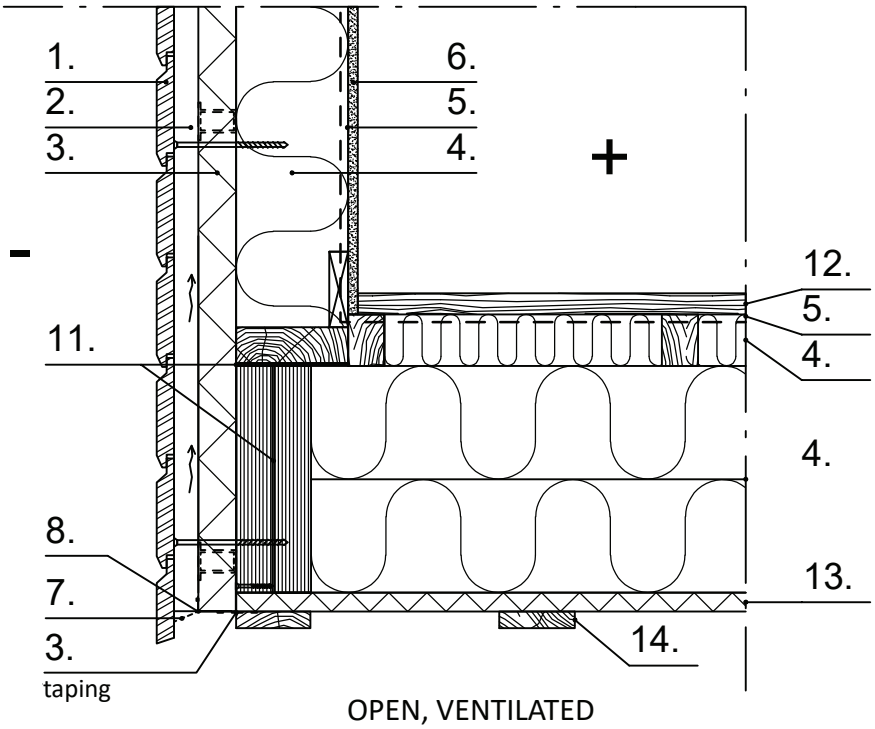
Construction site	Contents	EXTERNAL WALL AND BASE FLOOR JUNCTION CROSS-SECTION
Saint-Gobain Rakennustuotteet Oy	2b.	
APPENDIX 2: FACADE - SYSTEM INSTRUCTIONS NEWBUILD STRUCTURES	Date 08.10.2021 revision	US,mp — AP,rt



1. External cladding
2. Battening / ventilated air gap
3. ISOVER OL wind-protection coated thermal insulation
   - Joint sealing
     + ISOVER Facade Tape /
     + VARIO® - Facade Tape
     + ISOVER VarioBond sealing strip in joints to stone structures
   - RKL Termofix spacer under battening + fastening screws
4. Solid timber board CLT / LVL according to separate design
5. ISOVER Vario® Xtra moisture equalising vapour barrier if necessary
   - Joint sealing
     + VARIO® Multitape SL tape /
     + VARIO® KB 1 - Sealing tape
6. Gyproc GEK 13 if necessary
7. ISOVER mouse strip
8. ISOVER Vario® Plinth strip (moisture break + sealing strip)
9. Floorboarding / sheeting
10. ISOVER PREMIUM thermal insulation / battening
11. ISOVER insulation bracket (min. 5 pcs/slab) / preservative-treated support boards
    - The insulation bracket is installed to lightly compress the Facade slab without damaging the surface of the wind protection slab.
12. ISOVER Facade Tape / VARIO® Facade Tape

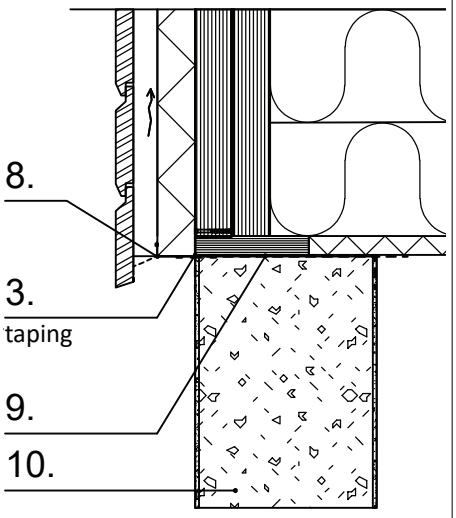
13. Plinth and base floor structure and foundation according to separate design
    - Plinth levelling and coating e.g. according to Weber plinth solutions

Construction site	Contents	EXTERNAL WALL AND BASE FLOOR JUNCTION CROSS-SECTION
Saint-Gobain Rakennustuotteet Oy	3a.	
APPENDIX 2: FACADE - SYSTEM INSTRUCTIONS NEWBUILD STRUCTURES	Date 08.10.2021 revision	US,rr — AP,vt



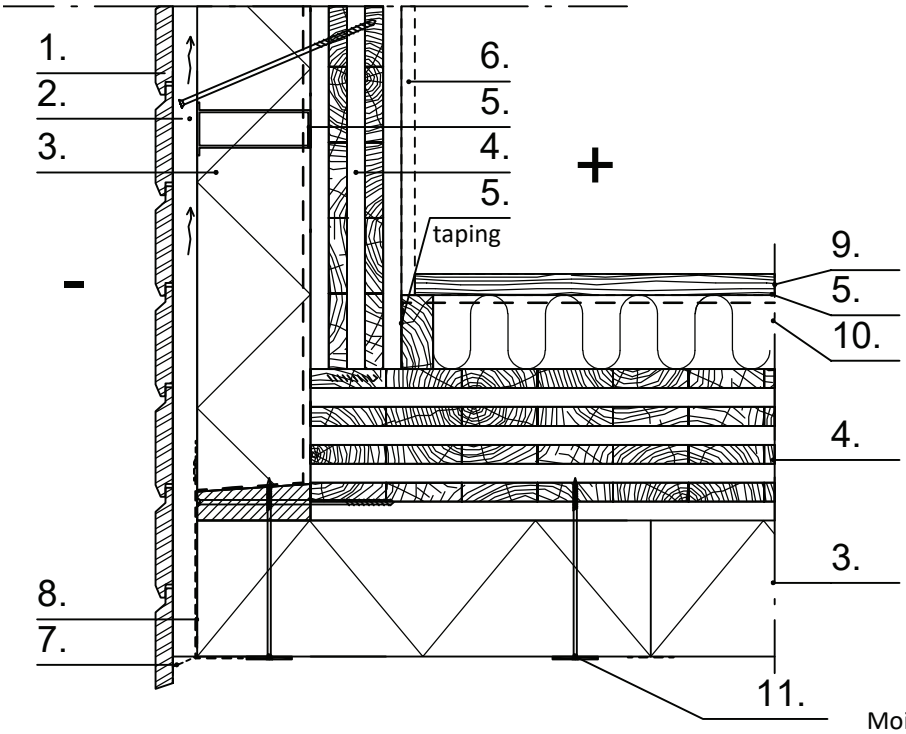
OPEN, VENTILATED
BASE FLOOR

FOUNDATION PILLAR

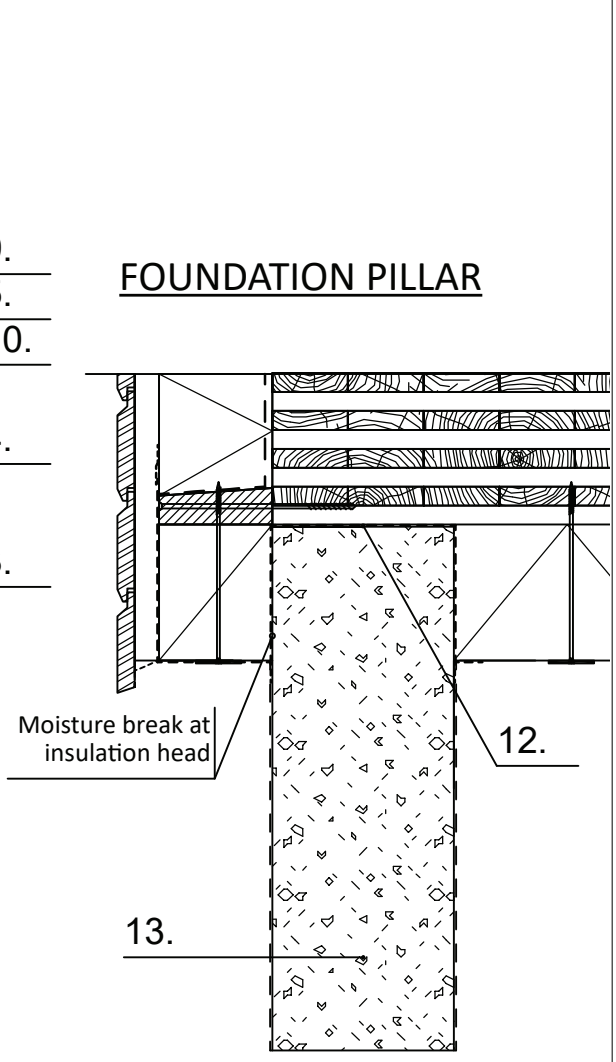


1. External cladding
2. Battening / ventilated air gap
3. ISOVER Facade wind-protection coated thermal insulation
   - Joint sealing
     + ISOVER Facade Tape /
     + VARIO® Facade Tape
     + ISOVER VarioBond sealing strip in joints to stone structures
   - RKL Termofix spacer under battening / Nail spacer
4. ISOVER PREMIUM 33 thermal insulation between balloon frame
5. ISOVER Vario® Xtra moisture equalising vapour barrier
   - Joint sealing
     + VARIO® Multitape SL tape /
     + VARIO® KB 1 - Sealing tape
6. Gyproc GEK 13
7. ISOVER mouse strip
8. ISOVER starter profile
9. ISOVER VARIO® Plinth strip / moisture break
10. Foundation pillar
    - Pillar foundation according to separate design
    - Plinth levelling and coating e.g. according to Weber plinth solutions
11. ISOVER KH-8 mineral wool mat
12. Floorboarding / sheeting
13. ISOVER Facade EJ
    - Joint sealing ISOVER Facade Tape / VARIO® Facade Tape
14. Support boards 22x100 (preservative treated) ctrs ≤ 600 and at joints of butted slabs

Construction site	Contents	EXTERNAL WALL AND BASE FLOOR JUNCTION CROSS-SECTION
Saint-Gobain Rakennustuotteet Oy	3b.	
APPENDIX 2: FACADE - SYSTEM INSTRUCTIONS NEWBUILD STRUCTURES	Date 08.10.2021	US,mp — AP,vt
	revision	

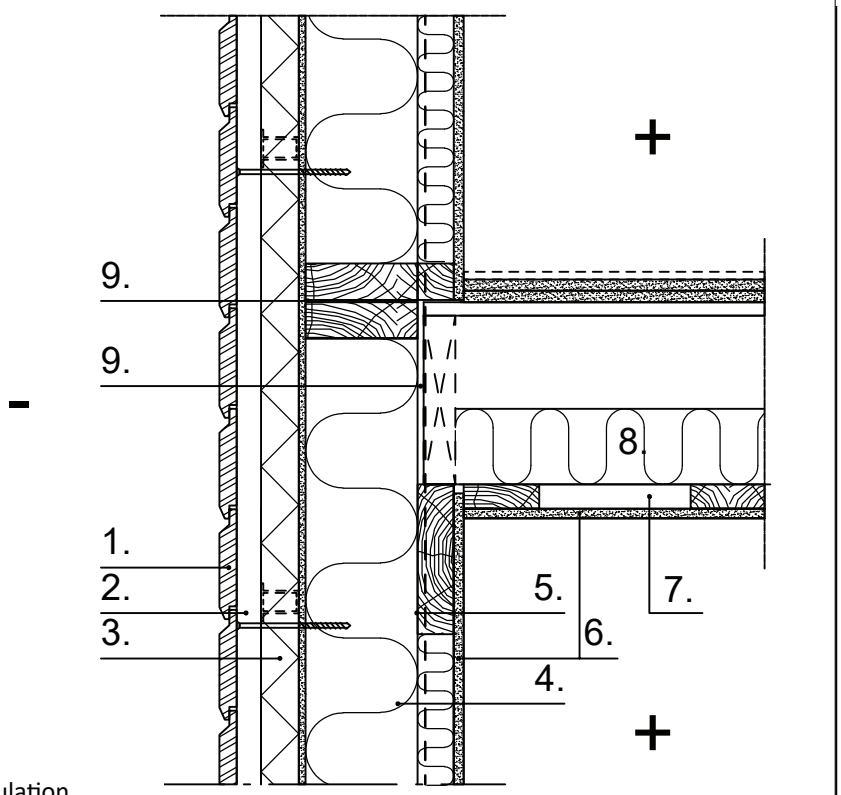


OPEN, VENTILATED BASE FLOOR



1. External cladding
2. Battening / ventilated air gap
3. ISOVER OL wind-protection coated thermal insulation
   - Joint sealing
     + ISOVER Facade Tape /
     + VARIO® Facade Tape
     + ISOVER VarioBond sealing strip in joints to stone structures
   - RKL Termofix spacer under battening + fastening screws
4. Solid timber board CLT / LVL according to separate design
5. ISOVER Vario® Xtra moisture equalising vapour barrier if necessary
   - Joint sealing
     + VARIO® Multitape SL tape /
     + VARIO® KB 1 - Sealing tape
6. Gyproc GEK 13 if necessary
7. ISOVER mouse strip
8. ISOVER SealStrip, edges taped with Facade tape
9. Floorboarding / sheeting
10. ISOVER PREMIUM thermal insulation / battening
11. ISOVER insulation bracket (min. 5 pcs/slab) / preservative-treated support boards
12. ISOVER Vario® Plinth strip / moisture break
13. Foundation pillar
    - Pillar foundation according to separate design
    - Plinth levelling and coating e.g. according to Weber plinth solutions

Construction site	Contents	EXTERNAL WALL AND BASE FLOOR JUNCTION CROSS-SECTION
Saint-Gobain Rakennustuotteet Oy	4a.	
APPENDIX 2: FACADE - SYSTEM INSTRUCTIONS NEWBUILD STRUCTURES	Date 08.10.2021	US,rr — VP
	revision	



1. External cladding
2. Battening / ventilated air gap
3. ISOVER Facade wind-protection coated thermal insulation
   - Joint sealing
     + ISOVER Facade Tape /
     + VARIO® Facade Tape

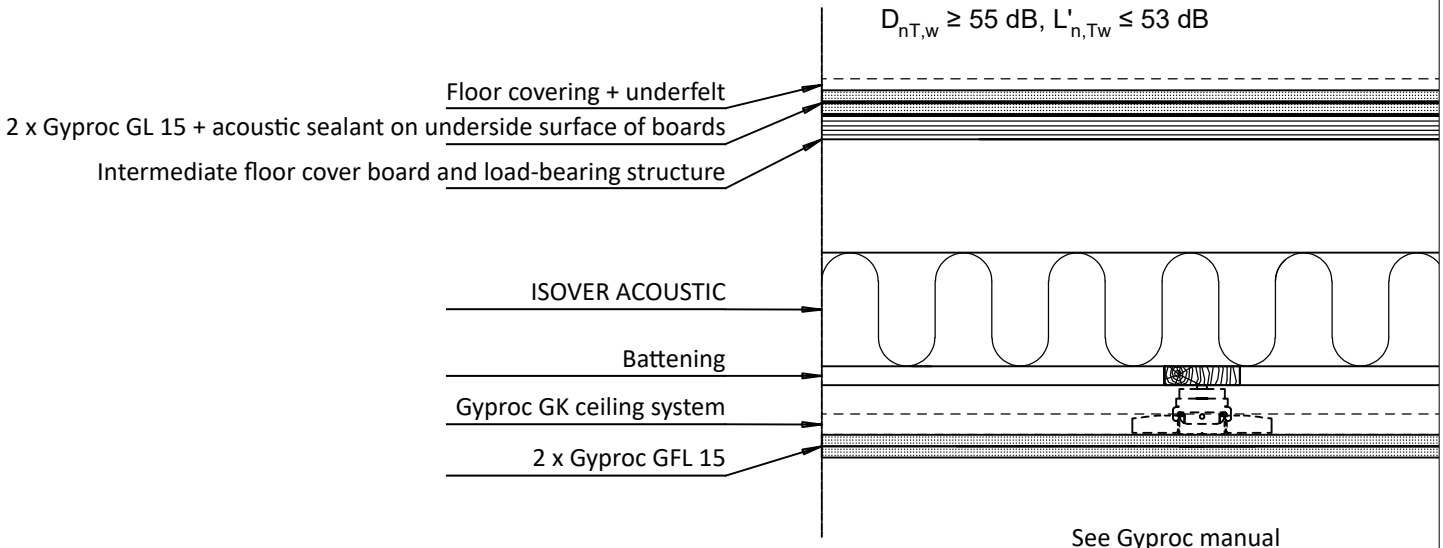
- RKL Termofix spacer under battening / Nail spacer

4. ISOVER PREMIUM 33 thermal insulation between balloon frame
5. ISOVER Vario® Xtra moisture equalising vapour barrier
   - Joint sealing
     + VARIO® Multitape SL tape /
     + VARIO® KB 1 - Sealing tape
6. Gyproc GN 13 (roof) / GEK 13 (wall)
7. Battening / air gap
8. ISOVER ACOUSTIC sound insulator wool
9. ISOVER KH / SK-C sealing strip

INTERMEDIATE FLOOR OF FLATS

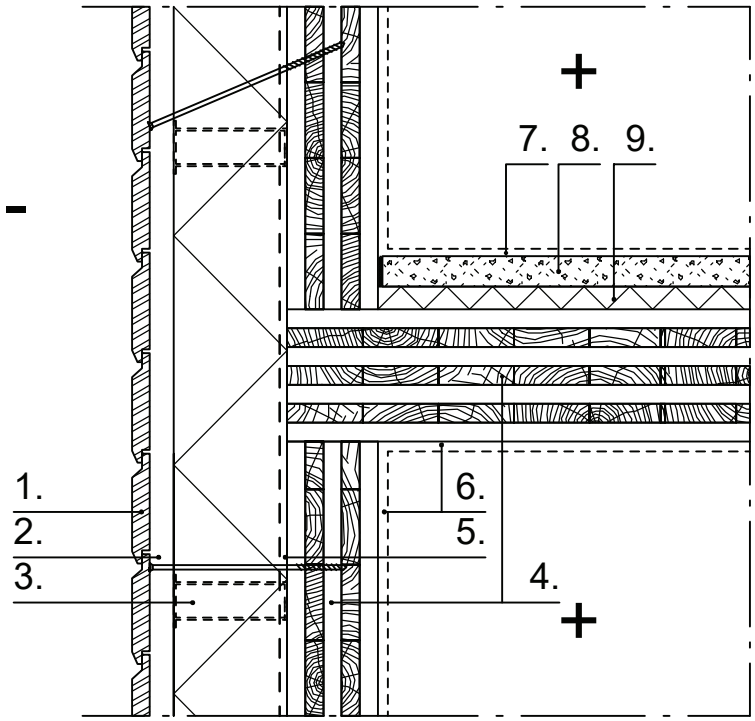
REI 30/60

$D_{nT,w} \geq 55$ dB, $L'_{n,Tw} \leq 53$ dB



See Gyproc manual

Construction site	Contents	EXTERNAL WALL AND BASE FLOOR JUNCTION CROSS-SECTION
Saint-Gobain Rakennustuotteet Oy	4a.	
APPENDIX 2: FACADE - SYSTEM INSTRUCTIONS NEWBUILD STRUCTURES	Date 08.10.2021	US,mp — VP,s
	revision	

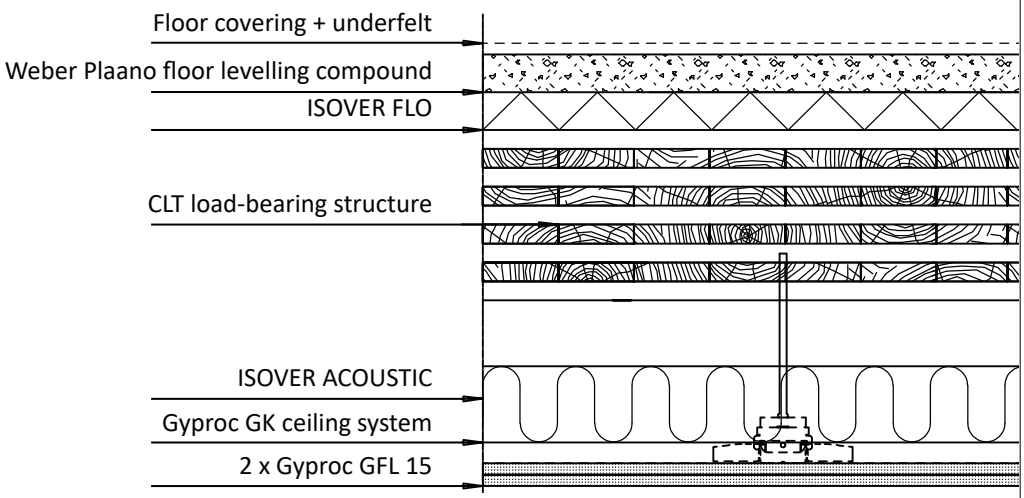


1. External cladding
2. Battening / ventilated air gap
3. ISOVER OL33 Facade wind-protection coated thermal insulation
   - Joint sealing
     + ISOVER Facade Tape /
     + VARIO® Facade Tape
   - RKL Termofix spacer under battening + fastening screws
4. Solid timber board CLT / LVL according to separate design
5. ISOVER Vario® Xtra moisture equalising vapour barrier if necessary
   - Joint sealing
     + VARIO® Multitape SL tape /
     + VARIO® KB1 sealing tape
6. Gyproc GN 13 (roof) / GEK 13 (wall)
7. Floor covering + acoustic underfelt
8. Weber Plaano floor levelling compound
9. ISOVER FLO impact sound insulation

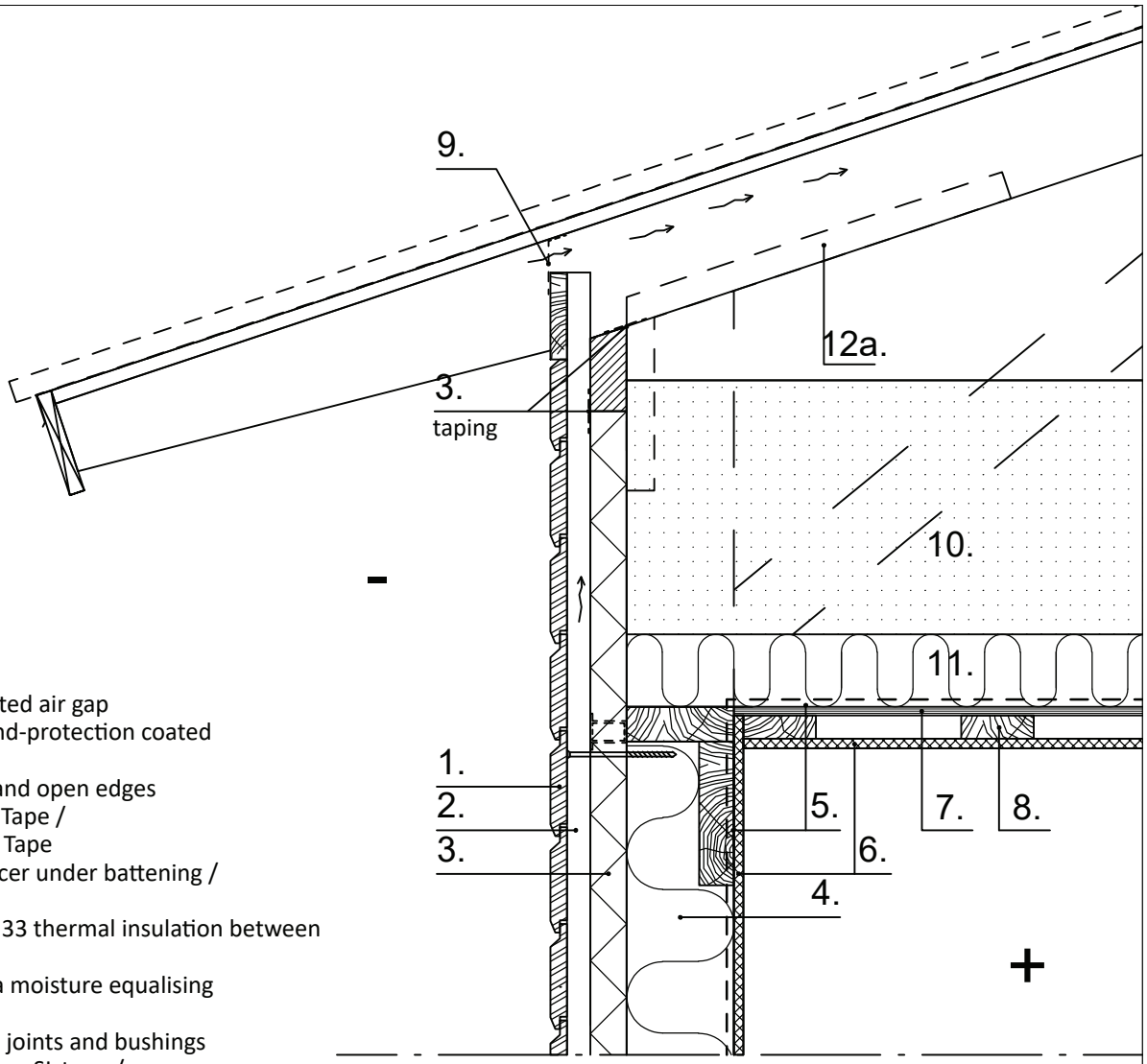
INTERMEDIATE FLOOR OF FLATS

REI 30/60

$D_{nT,w} \geq 55$ dB, $L'_{n,Tw} \leq 53$ dB



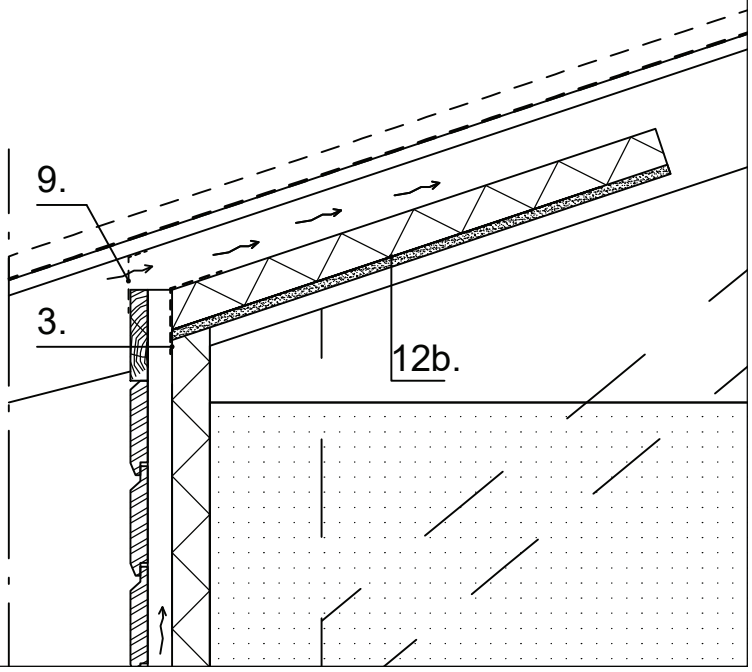
Construction site	Contents	EXTERNAL WALL AND BASE FLOOR JUNCTION CROSS-SECTION
Saint-Gobain Rakennustuotteet Oy	5a.	
APPENDIX 2: FACADE - SYSTEM INSTRUCTIONS NEWBUILD STRUCTURES	Date 08.10.2021 revision	US,rr — YP,s



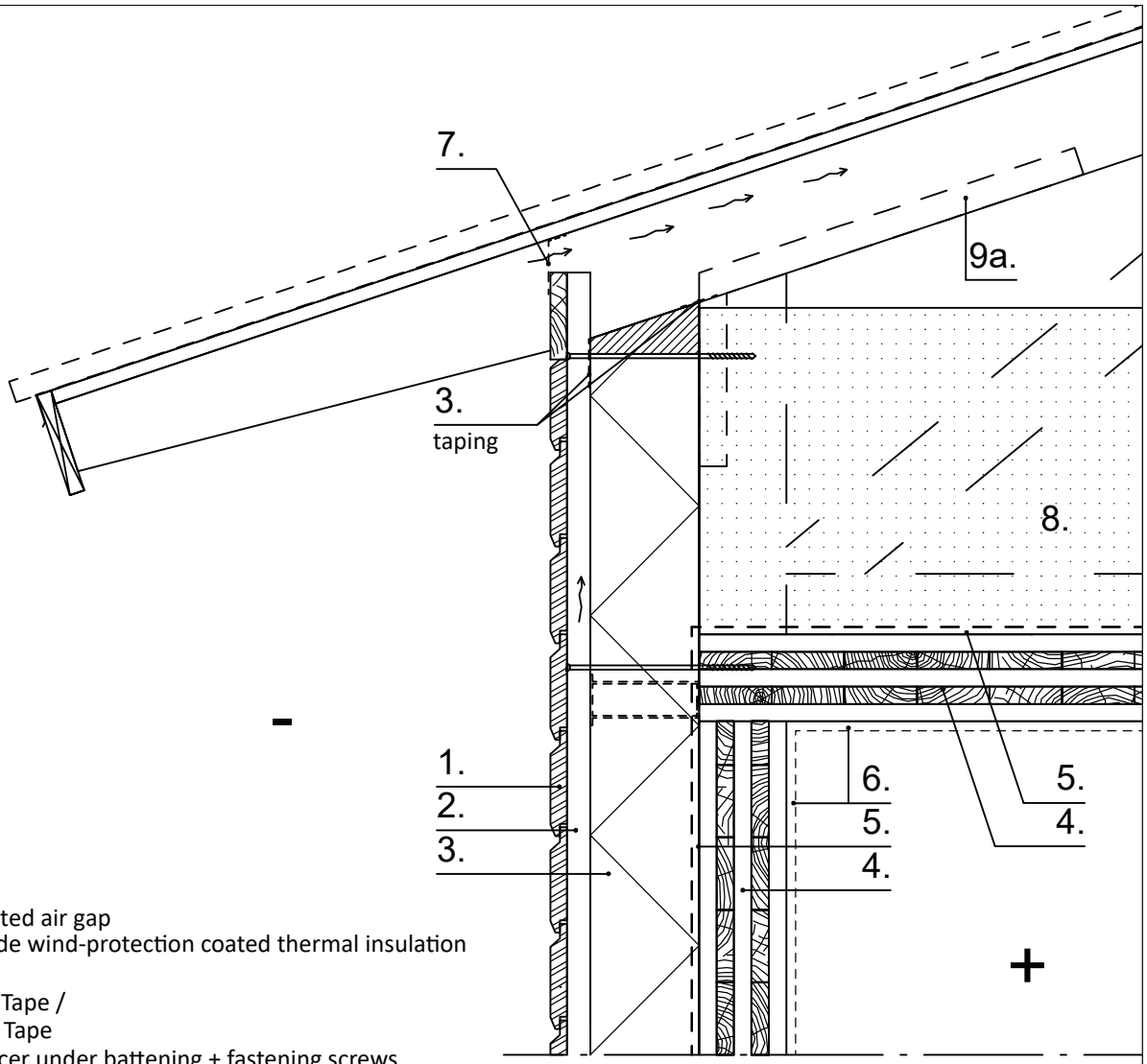
1. External cladding
2. Battening / ventilated air gap
3. ISOVER Facade wind-protection coated thermal insulation
   - Sealing of joints and open edges
     + ISOVER Facade Tape /
     + VARIO® Facade Tape
   - RKL Termofix spacer under battening / Nail spacer
4. ISOVER PREMIUM 33 thermal insulation between balloon frame
5. ISOVER Vario® Xtra moisture equalising vapour barrier
   - Sealing of seams, joints and bushings
     + VARIO® Multitape SL tape /
     + VARIO® KB 1 - Sealing tape
6. Gyproc GN 13 (roof) / GEK 13 (wall)
7. Building board (if necessary)
8. Battening / air gap
9. Insect/mouse mesh for ventilation gap
10. ISOVER INSULSAFE non-shrinking loose-fill insulation blown into cavities
11. ISOVER PREMIUM 33 thermal insulation between bottom chords

12a. ISOVER wind deflector

12b. Eaves sound trap
   - ISOVER RKL 50 mm + Gyproc Habito 13 mm



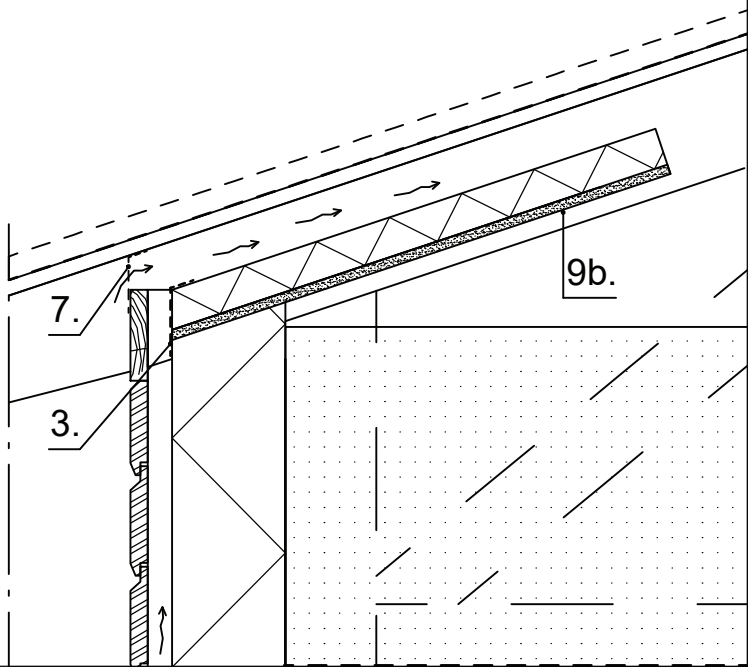
Construction site	Contents	EXTERNAL WALL AND BASE FLOOR JUNCTION CROSS-SECTION
Saint-Gobain Rakennustuotteet Oy	5b.	
APPENDIX 2: FACADE - SYSTEM INSTRUCTIONS NEWBUILD STRUCTURES	Date 08.10.2021 revision	US,mp — YP,s



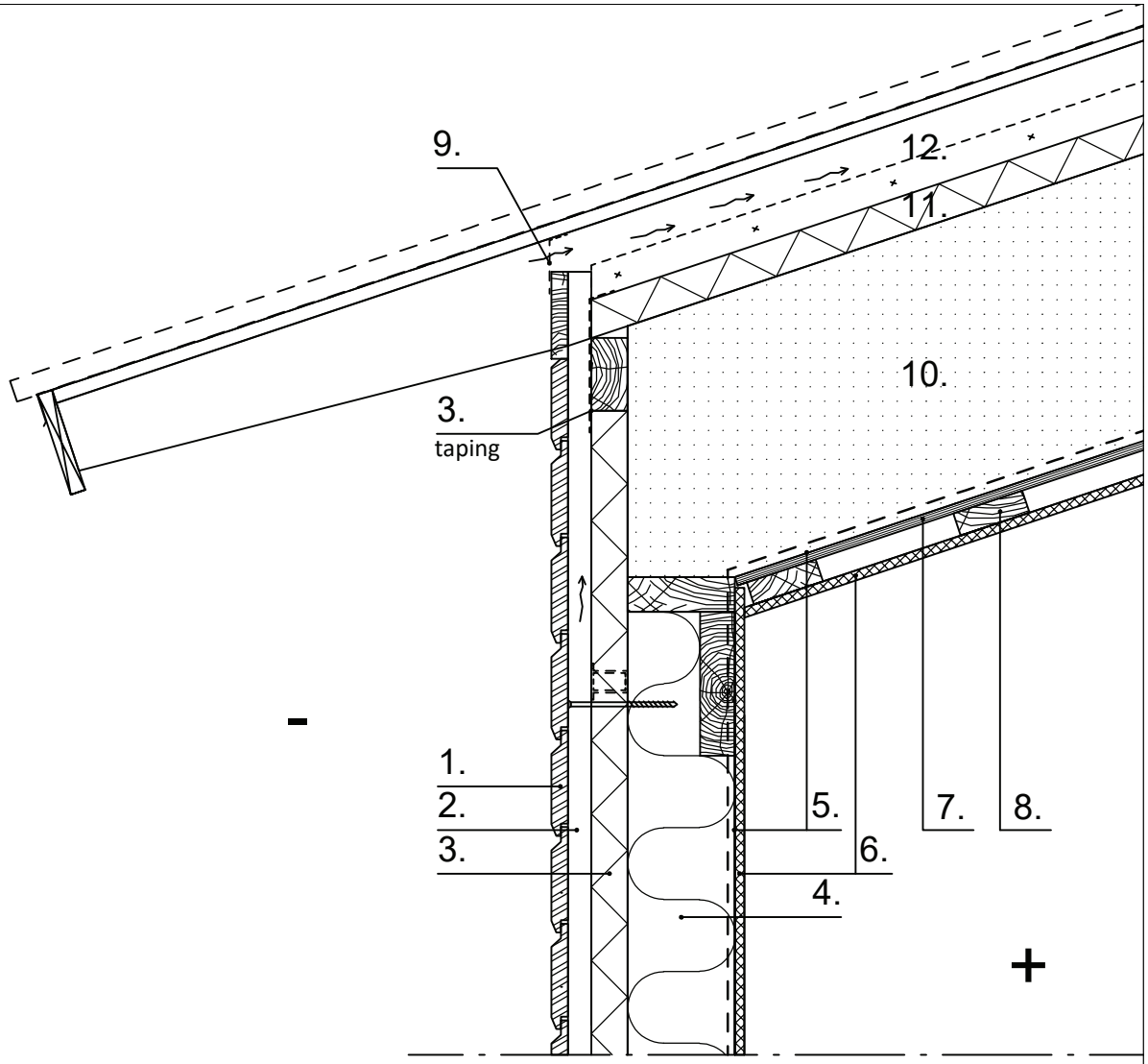
1. External cladding
2. Battening / ventilated air gap
3. ISOVER OL33 Facade wind-protection coated thermal insulation
   - Joint sealing
     + ISOVER Facade Tape /
     + VARIO® Facade Tape
   - RKL Termofix spacer under battening + fastening screws
4. Solid timber board CLT / LVL according to separate design
5. ISOVER Vario® Xtra moisture equalising vapour barrier if necessary
   - Joint sealing
     + VARIO® Multitape SL tape /
     + VARIO® KB 1 - Sealing tape
6. Gyproc GN 13 (roof) / GEK 13 (walls) if necessary
7. Insect/mouse mesh for ventilation gap
8. ISOVER INSULSAFE non-shrinking loose-fill insulation

9a. ISOVER wind deflector

9b. Eaves sound trap
   - ISOVER RKL 50 mm + Gyproc Habito 13 mm

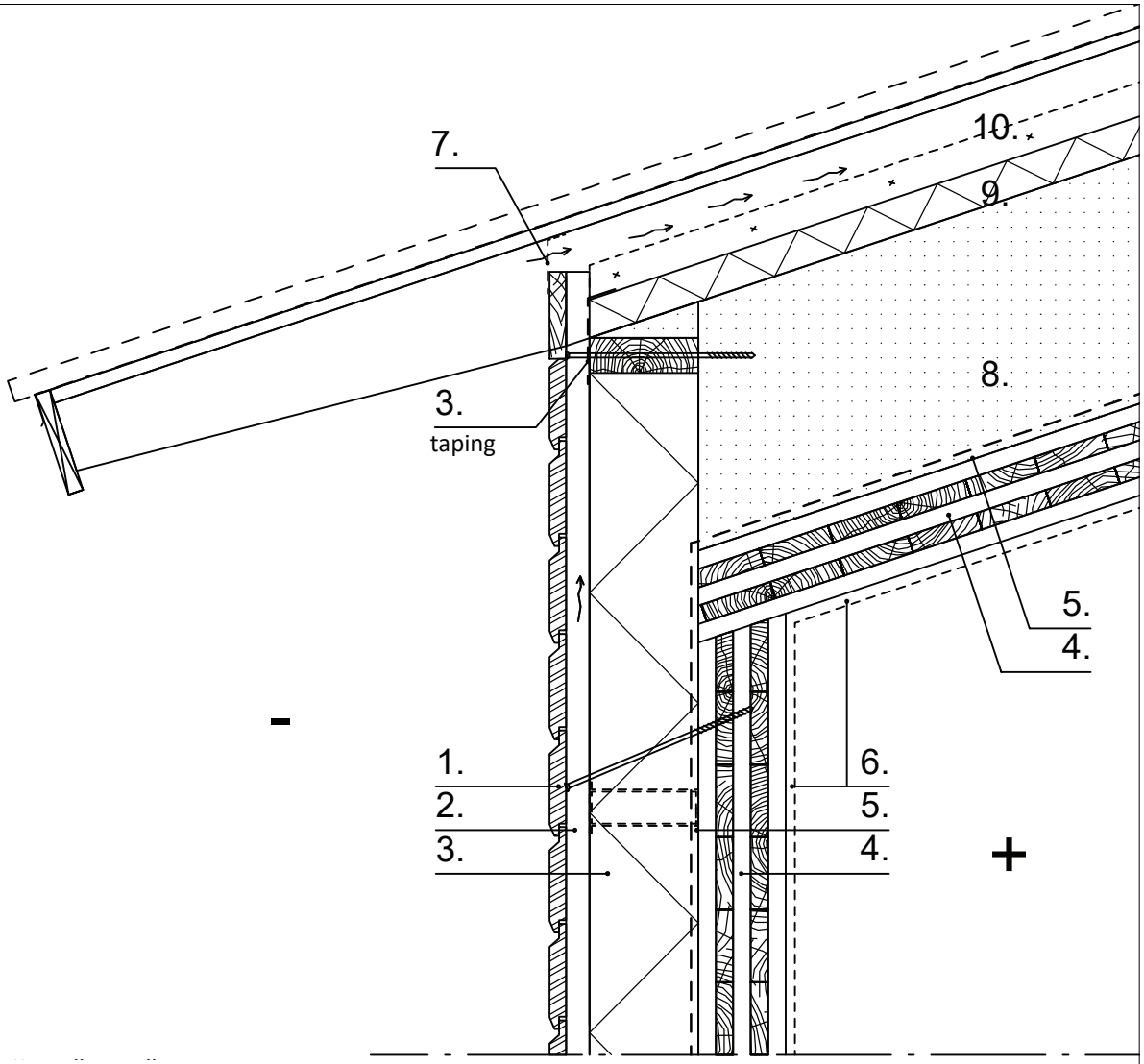


Construction site	Contents	EXTERNAL WALL AND BASE FLOOR JUNCTION CROSS-SECTION
Saint-Gobain Rakennustuotteet Oy	6a.	
APPENDIX 2: FACADE - SYSTEM INSTRUCTIONS NEWBUILD STRUCTURES	Date 08.10.2021	US,rr — YP,v
	revision	



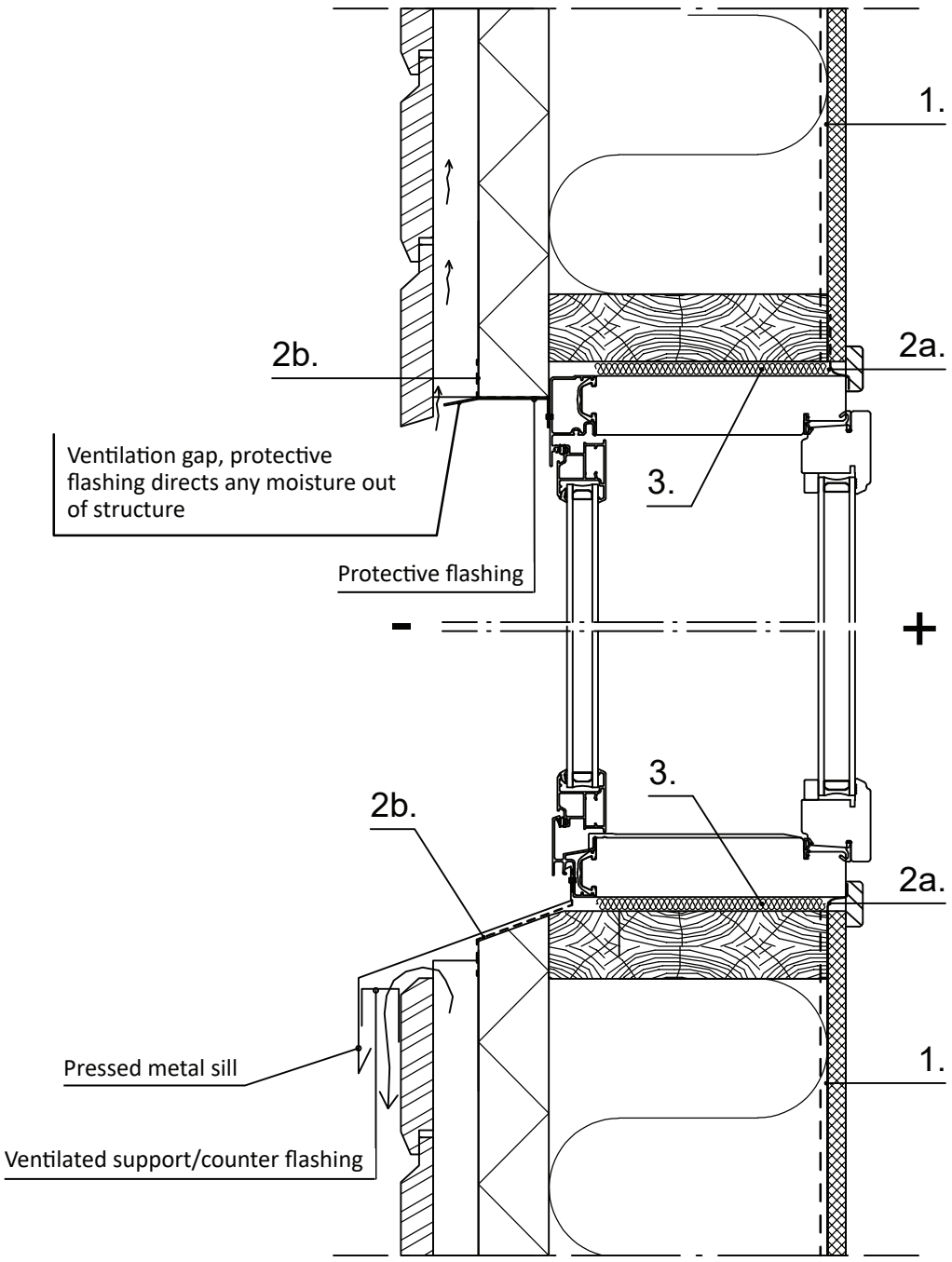
1. External cladding
2. Battening / ventilated air gap
3. ISOVER Facade wind-protection coated thermal insulation
   - Joint sealing
     + ISOVER Facade Tape /
     + VARIO® Facade Tape
   - RKL Termofix spacer under battening / Nail spacer
4. ISOVER PREMIUM 33 thermal insulation between balloon frame
5. ISOVER Vario® Xtra moisture equalising vapour barrier
   - Joint sealing
     + VARIO® Multitape SL tape /
     + VARIO® KB 1 - Sealing tape
6. Gyproc GN 13 (roof) / GEK 13 (wall)
7. Building board (if necessary)
8. Battening / air gap
9. Insect mesh for ventilation gap
10. ISOVER INSULSAFE non-shrinking loose-fill insulation blown into cavities
11. ISOVER RKL-31 + fastening battens
12. Air gap ≥ 100 mm

Construction site	Contents	EXTERNAL WALL AND BASE FLOOR JUNCTION CROSS-SECTION
Saint-Gobain Rakennustuotteet Oy	6b.	
APPENDIX 2: FACADE - SYSTEM INSTRUCTIONS NEWBUILD STRUCTURES	Date 08.10.2021	US,mp — YP,v
	revision	

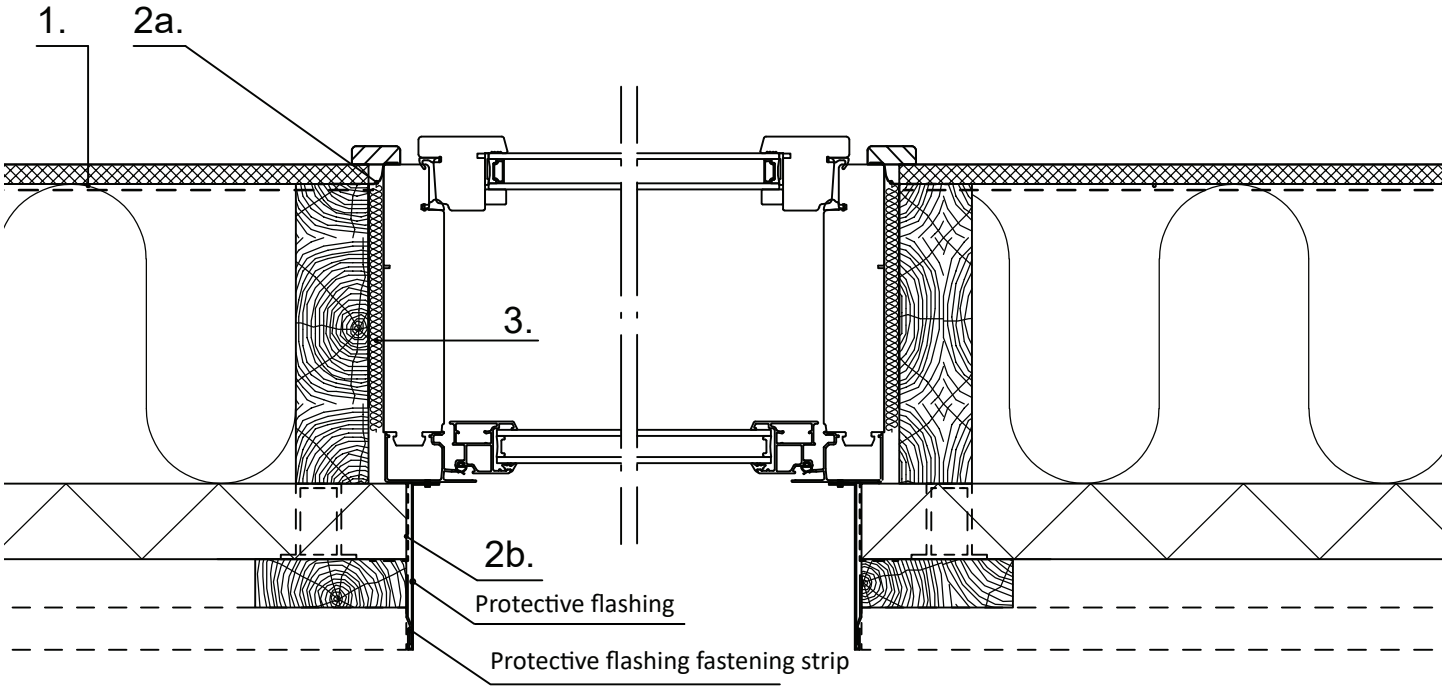


1. External cladding
2. Battening / ventilated air gap
3. ISOVER OL33 Facade wind-protection coated thermal insulation
   - Joint sealing
     + ISOVER Facade Tape /
     + VARIO® Facade Tape
   - RKL Termofix spacer under battening + fastening screws
4. Solid timber board CLT / LVL according to separate design
5. ISOVER Vario® Xtra moisture equalising vapour barrier if necessary
   - Joint sealing
     + VARIO® Multitape SL tape /
     + VARIO® KB 1 - Sealing tape
6. Gyproc GN 13 (roof) / GEK 13 (wall)
7. Insect mesh for ventilation gap
8. ISOVER INSULSAFE non-shrinking loose-fill insulation
9. ISOVER RKL FACADE
10. Fastening battens and air gap ≥ 100 mm

Construction site	Contents WINDOW JUNCTION	
Saint-Gobain Rakennustuotteet Oy	7a.	
APPENDIX 2: FACADE - SYSTEM INSTRUCTIONS NEWBUILD STRUCTURES	Date 08.10.2021 revision	US,rr — WINDOW



Construction site	Contents WINDOW JUNCTION	
ISOVER Saint-Gobain Rakennustuotteet Oy	7a.	
APPENDIX 2: FACADE - SYSTEM INSTRUCTIONS NEWBUILD STRUCTURES	Date 08.10.2021	US,rr — WINDOW
	revision	



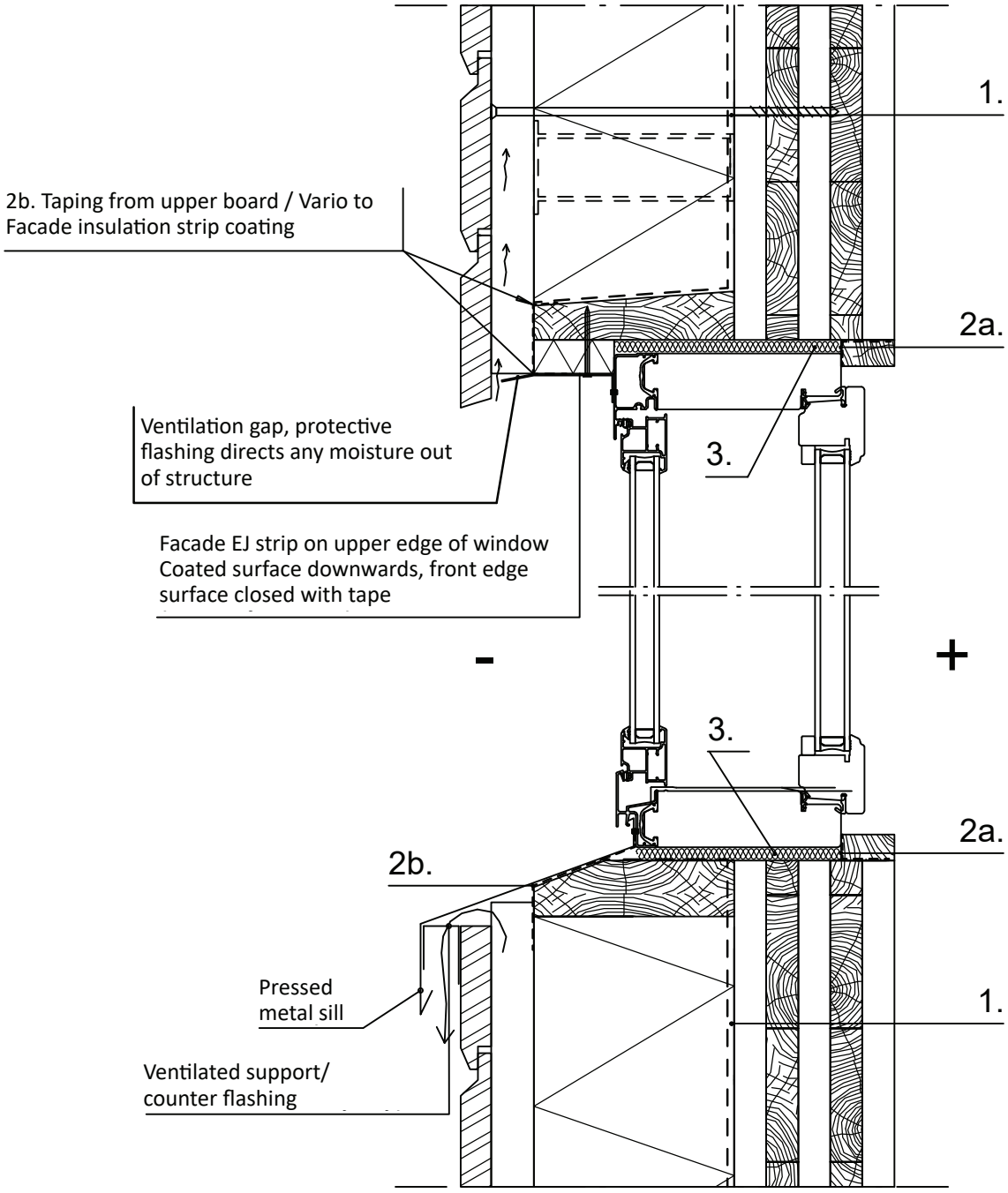
1. ISOVER Vario® Xtra XL smart vapour barrier film
   - seams and joints sealed with Vario System tape (2)

2a. ISOVER Vario® MultiTape SL / SL Wide sealing tape
   - Sealing of joint between frame and wall vapour barrier inside

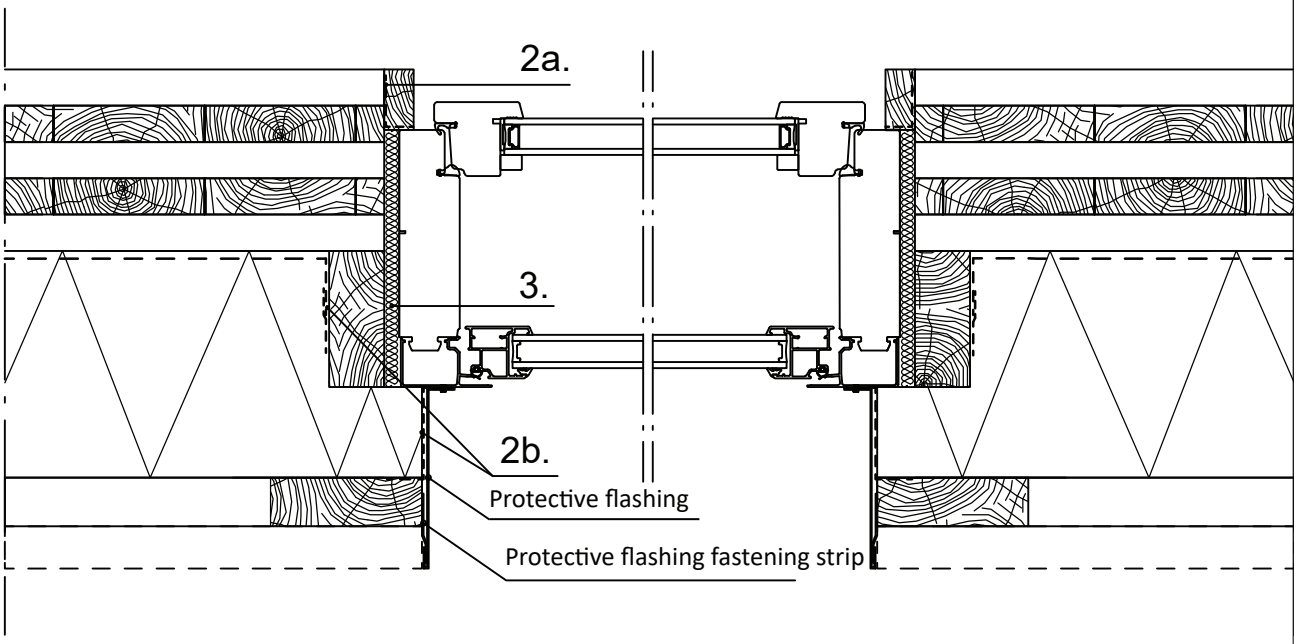
2b. ISOVER Vario® MultiTape SL / SL Wide sealing tape
   - Sealing of joint between frame and wall vapour barrier outside
   - Taping from Facade outer surface to window frame outer surface

3. ISOVER SK-C / KH wool strip
   - Thermal insulation/sealing in window frame and frame junction
   Installed tightly around window. Thickness of strip chosen to be greater than nominal joint thickness to make joint tight

Construction site	Contents WINDOW JUNCTION 7b.	
Saint-Gobain Rakennustuotteet Oy		
APPENDIX 2: FACADE - SYSTEM INSTRUCTIONS NEWBUILD STRUCTURES	Date 08.10.2021 revision	US,mp — WINDOW



Construction site	Contents WINDOW JUNCTION	
Saint-Gobain Rakennustuotteet Oy	7b.	
APPENDIX 2: FACADE - SYSTEM INSTRUCTIONS NEWBUILD STRUCTURES	Date 08.10.2021 revision	US,mp — WINDOW



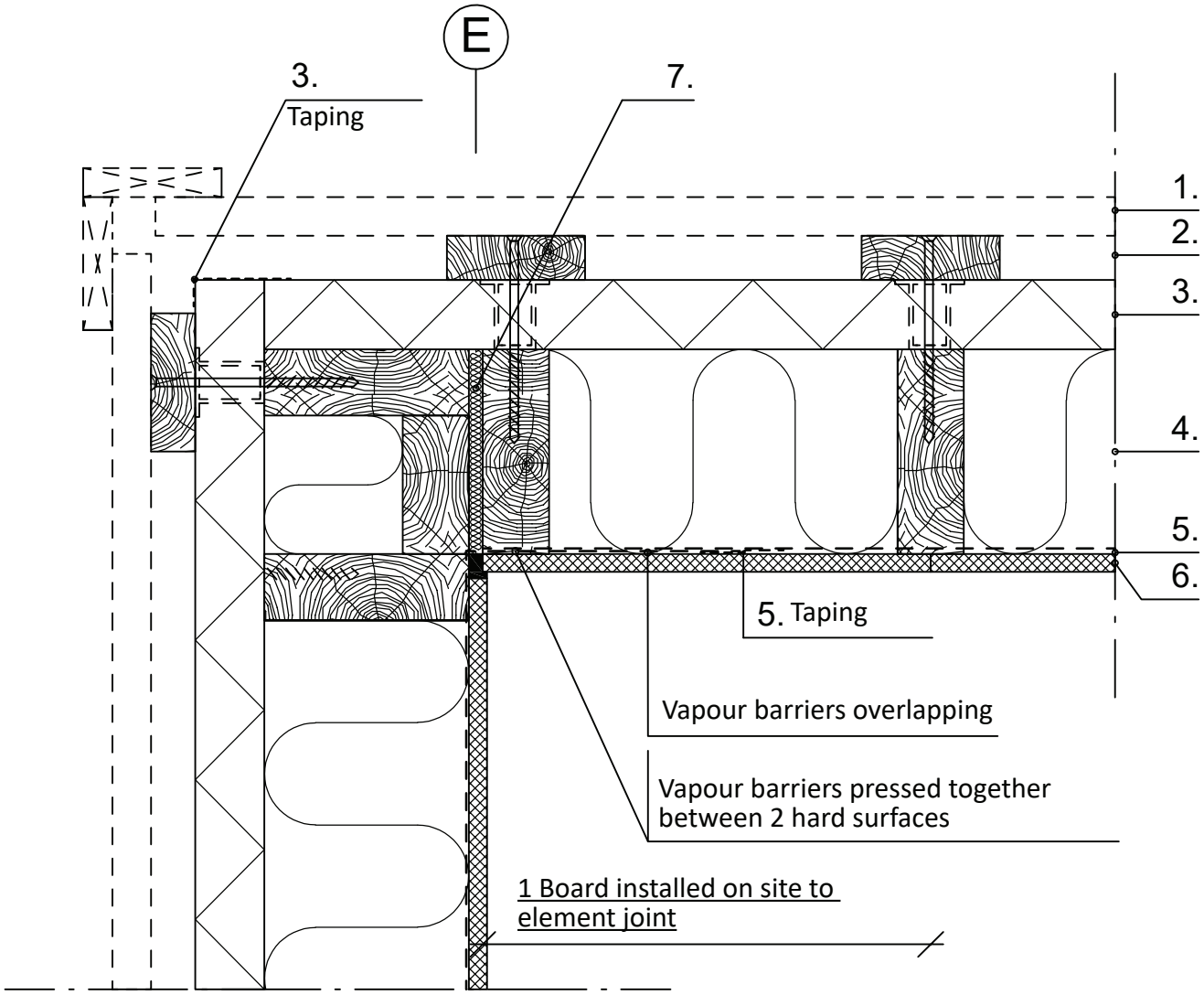
1. ISOVER Vario® Xtra XL smart vapour barrier film
   - seams and joints sealed with Vario System tape (2)

2a. ISOVER Vario® MultiTape SL / SL Wide sealing tape
   - Sealing of joint between frame and wall vapour barrier inside

2b. ISOVER Vario® MultiTape SL / SL Wide sealing tape
   - Sealing of joint between frame and wall vapour barrier outside
   - Taping from Facade outer surface to window frame outer surface

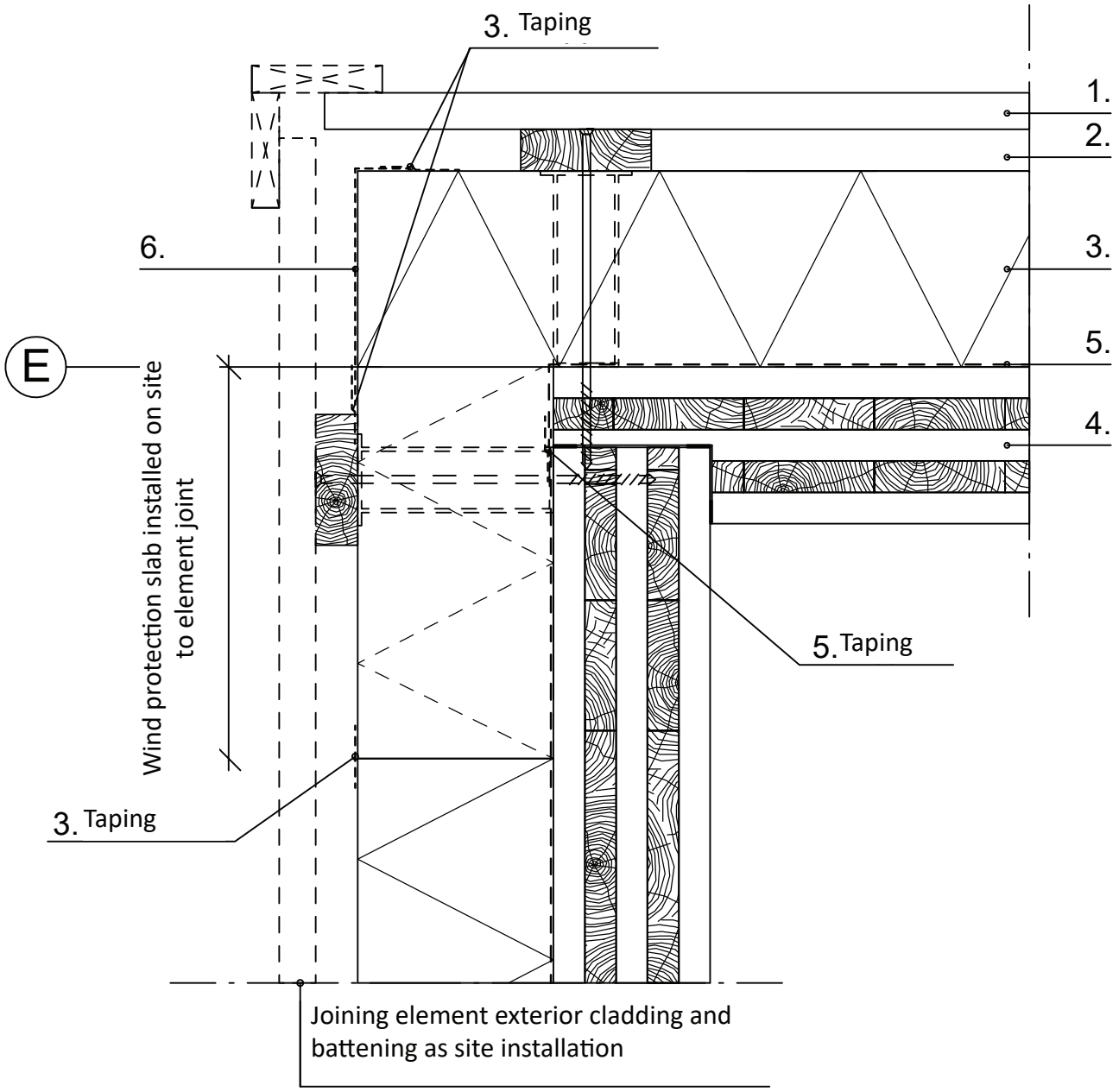
3. ISOVER SK-C / KH wool strip
   - Thermal insulation/sealing in window frame and frame junction
   Installed tightly around window. Thickness of strip chosen to be greater than nominal joint thickness to make joint tight

Construction site	Contents	OUTSIDE CORNER JOINT OF EXTERNAL WALL PANELS
ISOVER Saint-Gobain Rakennustuotteet Oy	8a.	
APPENDIX 2: FACADE - SYSTEM INSTRUCTIONS NEWBUILD STRUCTURES	Date 08.10.2021	US,rr — UN
	revision	



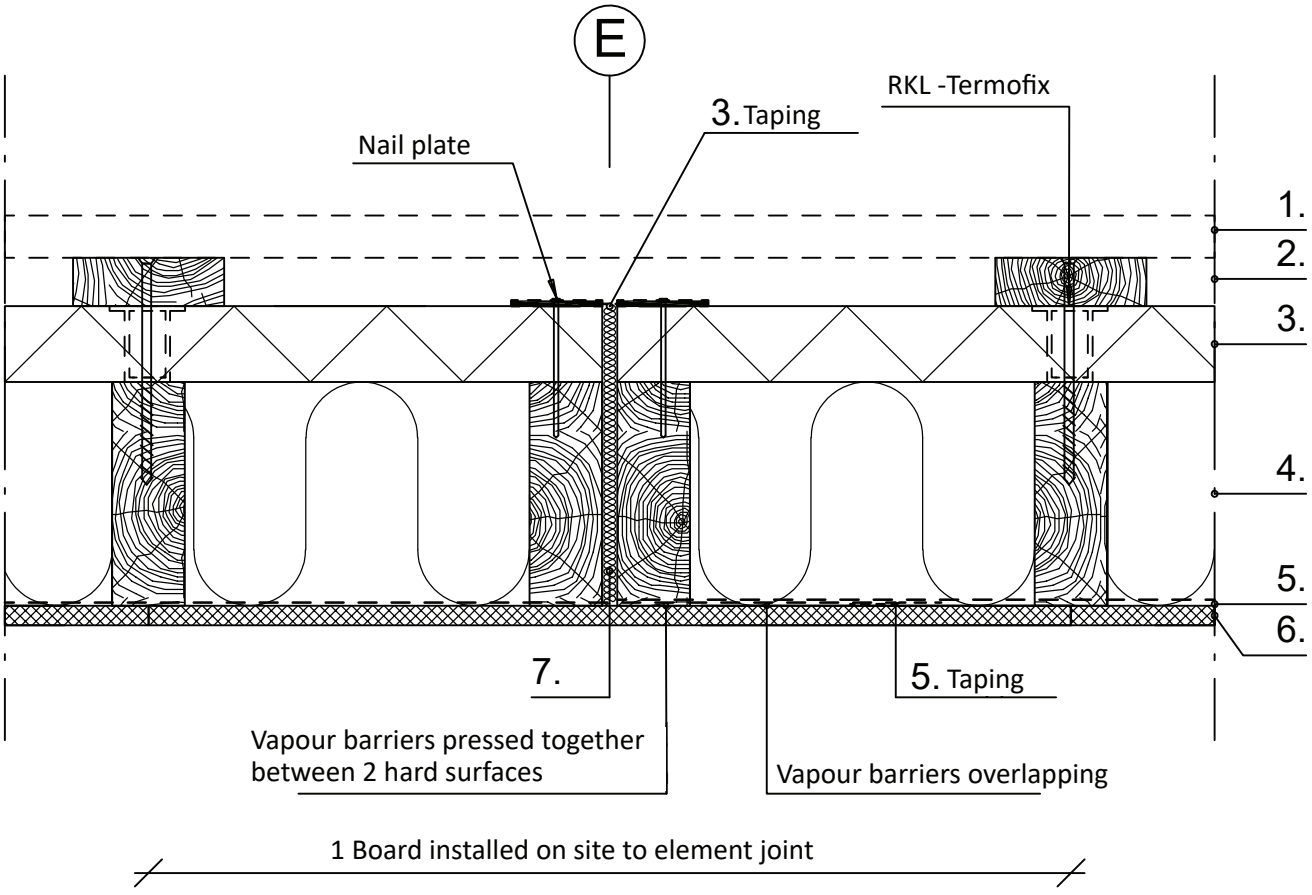
1. External cladding
2. Battening / ventilated air gap
3. ISOVER Facade wind-protection coated thermal insulation
   - Joint sealing
     + ISOVER Facade Tape /
     + VARIO® Facade Tape
     + ISOVER VarioBond sealing strip in joints to stone structures
   - RKL Termofix spacer under battening / Nail spacer
4. ISOVER PREMIUM 33 thermal insulation between balloon frame
5. ISOVER Vario® Xtra moisture equalising vapour barrier
   - Joint sealing
     + VARIO® Multitape SL tape /
     + VARIO® KB 1 - Sealing tape
6. Gyproc GEK 13
7. ISOVER KH / SK-C sealing strip for element joint

Construction site	Contents	OUTSIDE CORNER JOINT OF EXTERNAL WALL PANELS
ISOVER Saint-Gobain Rakennustuotteet Oy	8b.	
APPENDIX 2: FACADE - SYSTEM INSTRUCTIONS NEWBUILD STRUCTURES	Date 08.10.2021	US,mp — UN
	revision	



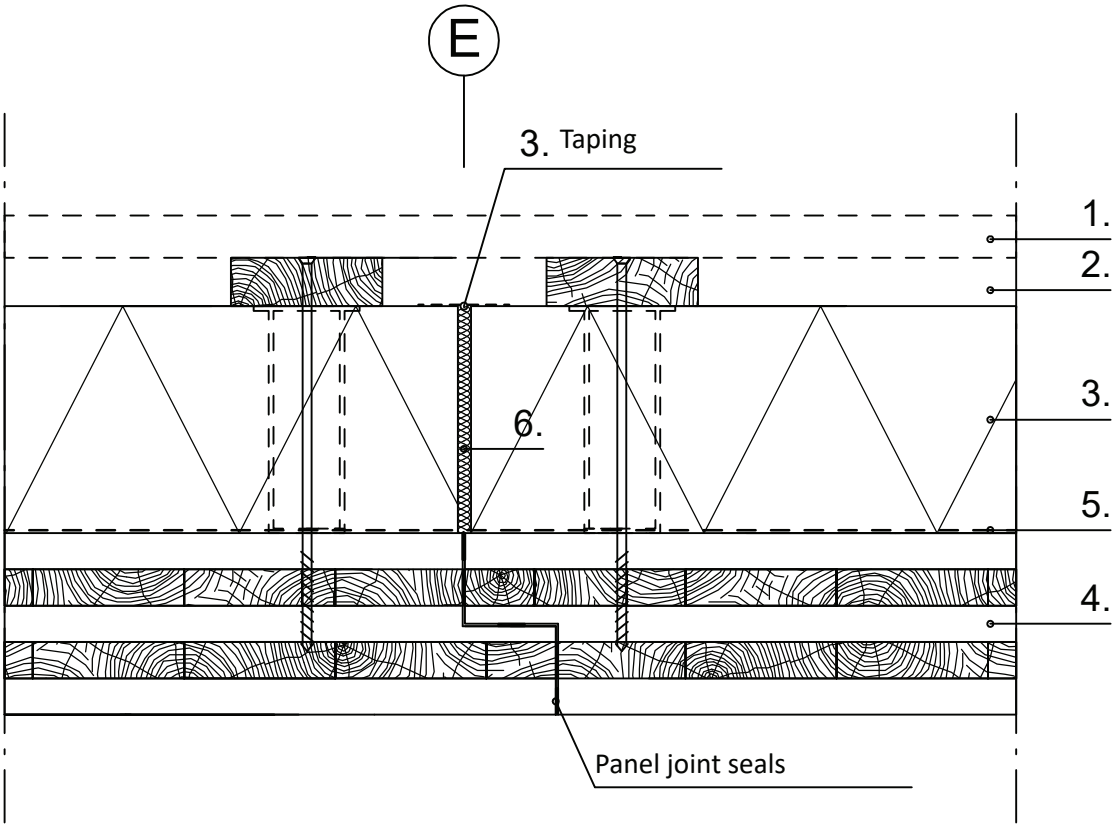
1. External cladding
2. Battening / ventilated air gap
3. ISOVER OL33 Facade wind-protection coated thermal insulation
   - Joint sealing
     + ISOVER Facade Tape /
     + VARIO® Facade Tape
   - RKL Termofix spacer under battening + fastening screws
4. Solid timber board CLT / LVL according to separate design
5. ISOVER Vario® Xtra moisture equalising vapour barrier if necessary
   - Joint sealing
     + VARIO® Multitape SL tape
     + VARIO® KB 1 - Sealing tape
6. ISOVER SealStrip

Construction site	Contents	STRAIGHT JOINT OF EXTERNAL WALL PANELS
Saint-Gobain Rakennustuotteet Oy	9a.	
APPENDIX 2: FACADE - SYSTEM INSTRUCTIONS NEWBUILD STRUCTURES	Date 08.10.2021	US,rr - US,rr
	revision	



1. External cladding
2. Battening / ventilated air gap
3. ISOVER Facade wind-protection coated thermal insulation
   - Joint sealing
     + ISOVER Facade Tape /
     + VARIO® Facade Tape
     + ISOVER VarioBond sealing strip in joints to stone structures
   - RKL Termofix spacer under battening / Nail spacer
4. ISOVER PREMIUM 33 thermal insulation between balloon frame
5. ISOVER Vario® Xtra moisture equalising vapour barrier
   - Joint sealing
     + VARIO® Multitape SL tape /
     + VARIO® KB 1 - Sealing tape
6. Gyproc GEK 13
7. ISOVER KH/SK-C sealing strip for element joint

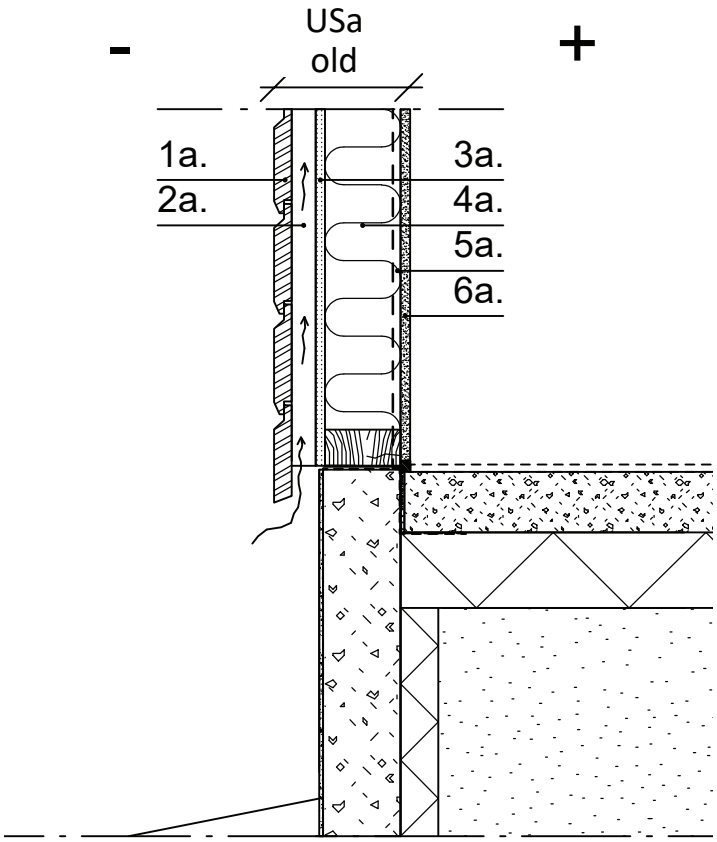
Construction site	Contents	STRAIGHT JOINT OF EXTERNAL WALL PANELS
Saint-Gobain Rakennustuotteet Oy	9b.	
APPENDIX 2: FACADE - SYSTEM INSTRUCTIONS NEWBUILD STRUCTURES	Date 08.10.2021	US,mp - US,mp
	revision	



1. Exterior cladding, at element joint as site installation
2. Battening / ventilated air gap
3. ISOVER OL33 Facade wind-protection coated thermal insulation
   - Joint sealing
     + ISOVER Facade Tape /
     + VARIO® Facade Tape
   - RKL Termofix spacer under battening + fastening screws
4. Solid timber board CLT / LVL according to separate design
5. ISOVER Vario® Xtra moisture equalising vapour barrier if necessary
   - Joint sealing
     + VARIO® Multitape SL tape /
     + VARIO® KB 1 - Sealing tape
6. ISOVER KH / SK-C sealing strip for element joint

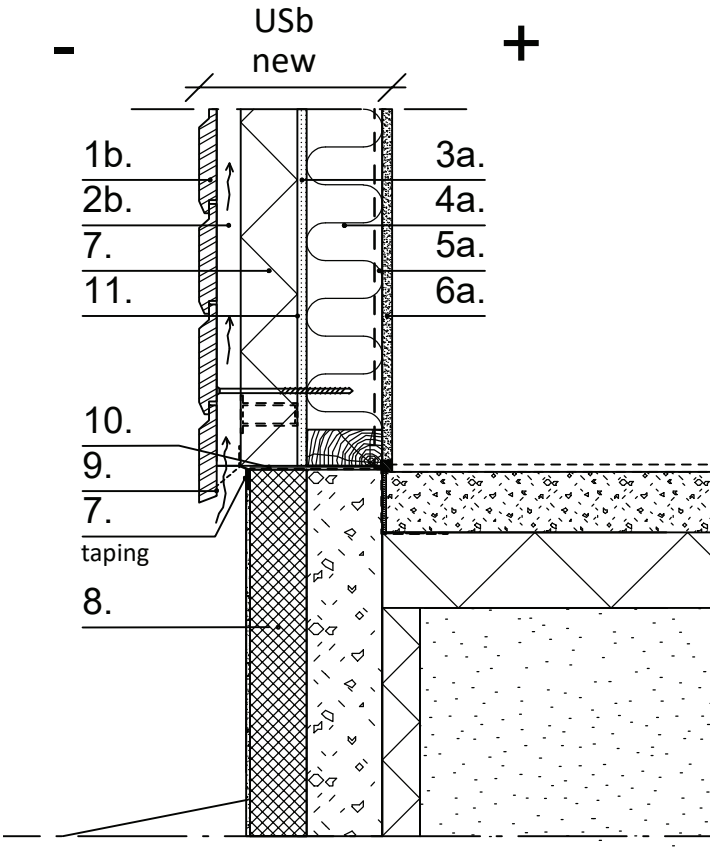
Construction site	Contents	EXTERNAL WALL AND GROUND-SUPPORTED BASE FLOOR JUNCTION:
Saint-Gobain Rakennustuotteet Oy	10a.	
APPENDIX 2: FACADE - SYSTEM INSTRUCTIONS RENOVATION	Date 08.10.2021	US - AP,mp
	revision	

A. ORIGINAL STRUCTURE



1a. External cladding
2a. Ventilation battens and air gap
3a. Woodfibre board 12 mm /
close boarding 25 mm + paper
4a. Mineral wool /
woodchip insulation + frame 50 mm ctrs600
5a. Vapour barrier plastic/paper
6a. Interior cladding (wood panelling 15 mm)

B. ADDITIONALLY INSULATED STRUCTURE



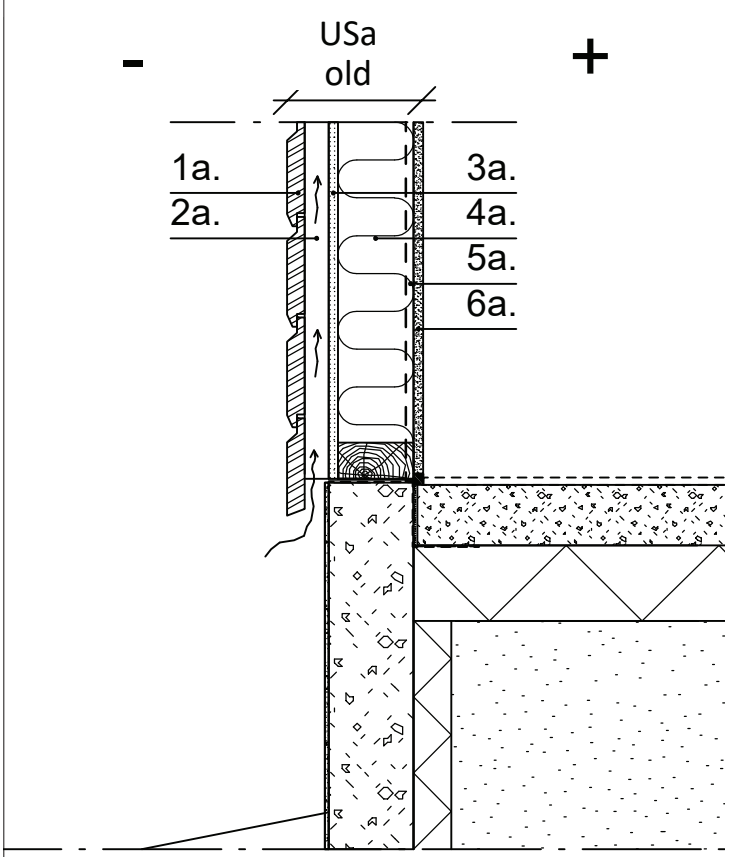
1b. External cladding
2b. Ventilation battens and air gap
7. ISOVER Facade wind-protection coated thermal insulation
- Joint sealing
+ ISOVER Facade Tape /
+ VARIO® Facade Tape
+ ISOVER VarioBond sealing strip in joints to stone structures
- RKL Termofix spacer under battening / Nail spacer
8. Possible thermal insulation and coating of plinth
9. ISOVER mouse strip
10. ISOVER Vario® Plinth strip
(moisture break + sealing strip)
11. Levelling/sealing wool ISOVER KH if necessary

Structure›s U value (W/m²K), when additional external thermal insulation is added to structure					
Present structure / U value (W/m2K)		Facade 25 mm	Facade 50 mm	Facade 75 mm	Facade 100 mm
Woodchip insulation 100 mm.	0.56	0.38	0.29	0.24	0.20
Woodchip insulation 125 mm.	0.48	0.34	0.27	0.22	0.19
Mineral wool 100 mm.	0.39	0.30	0.24	0.20	0.17
Mineral wool 125 mm.	0.33	0.26	0.21	0.18	0.16

(λ_D 0.08 W/mK) used as thermal insulation capacity of woodchip insulation.
(λ_D 0.045 W/mK) used as thermal insulation capacity of old mineral wool.
Resistance of interior and exterior surface 013 m²K/W.

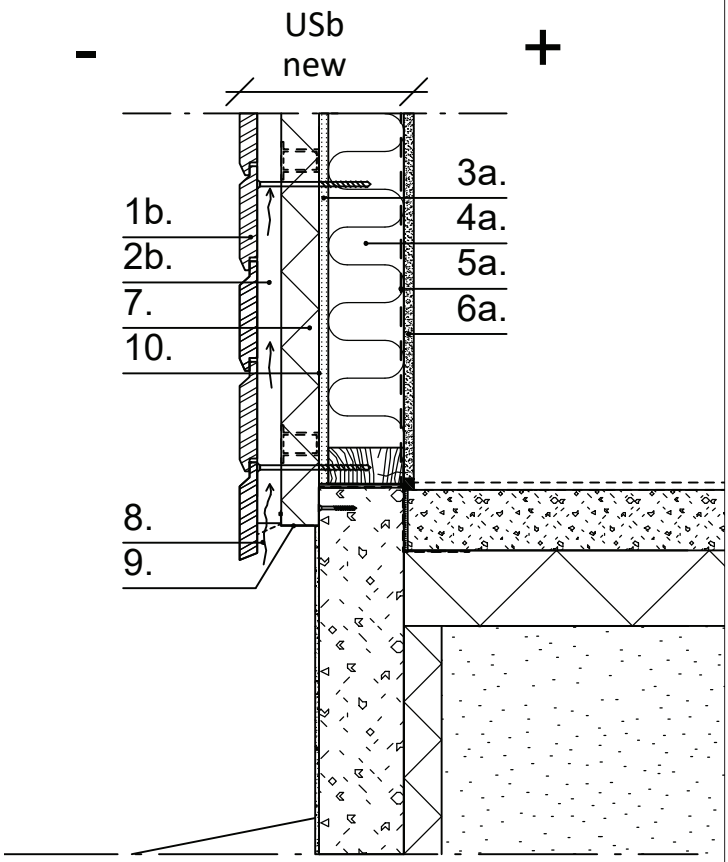
Construction site	Contents	EXTERNAL WALL AND GROUND-SUPPORTED BASE FLOOR JUNCTION:
ISOVER Saint-Gobain Rakennustuotteet Oy	10b.	
APPENDIX 2: FACADE - SYSTEM INSTRUCTIONS RENOVATION	Date 08.10.2021	US - AP,mp
	revision	

A. ORIGINAL STRUCTURE



1a. External cladding
2a. Ventilation battens and air gap
3a. Woodfibre board 12 mm /
close boarding 25 mm + paper
4a. Mineral wool /
woodchip insulation + frame 50 mm ctrs600
5a. Vapour barrier plastic/paper
6a. Interior cladding (wood panelling 15 mm)

B. ADDITIONALLY INSULATED STRUCTURE



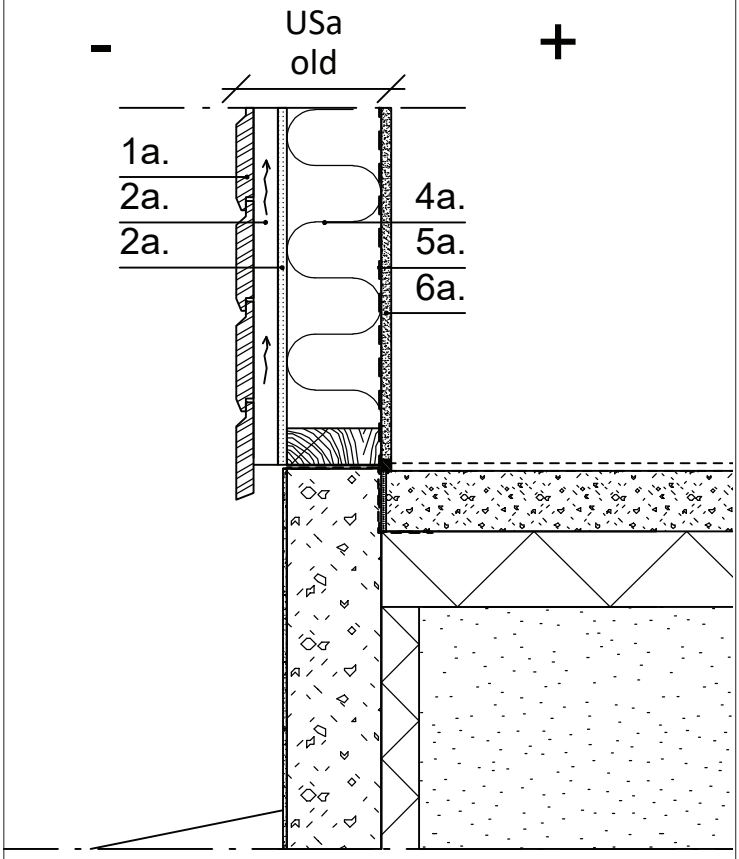
1b. External cladding
2b. Ventilation battens and air gap
7. ISOVER Facade wind-protection coated thermal insulation
- Joint sealing
+ ISOVER Facade Tape /
+ VARIO® Facade Tape
+ ISOVER VarioBond sealing strip in joints to stone structures
- RKL Termofix spacer under battening / Nail spacer
8. ISOVER mouse strip
9. ISOVER Starter profile
10. Levelling/sealing wool ISOVER KH if necessary

Structure›s U value (W/m²K), when additional external thermal insulation is added to structure					
Present structure / U value (W/m2K)		Facade 25 mm	Facade 50 mm	Facade 75 mm	Facade 100 mm
Woodchip insulation 100 mm.	0.56	0.38	0.29	0.24	0.20
Woodchip insulation 125 mm.	0.48	0.34	0.27	0.22	0.19
Mineral wool 100 mm.	0.39	0.30	0.24	0.20	0.17
Mineral wool 125 mm.	0.33	0.26	0.21	0.18	0.16

(λ_D 0.08 W/mK) used as thermal insulation capacity of woodchip insulation.
(λ_D 0.045 W/mK) used as thermal insulation capacity of old mineral wool.
Resistance of interior and exterior surface 013 m²K/W.

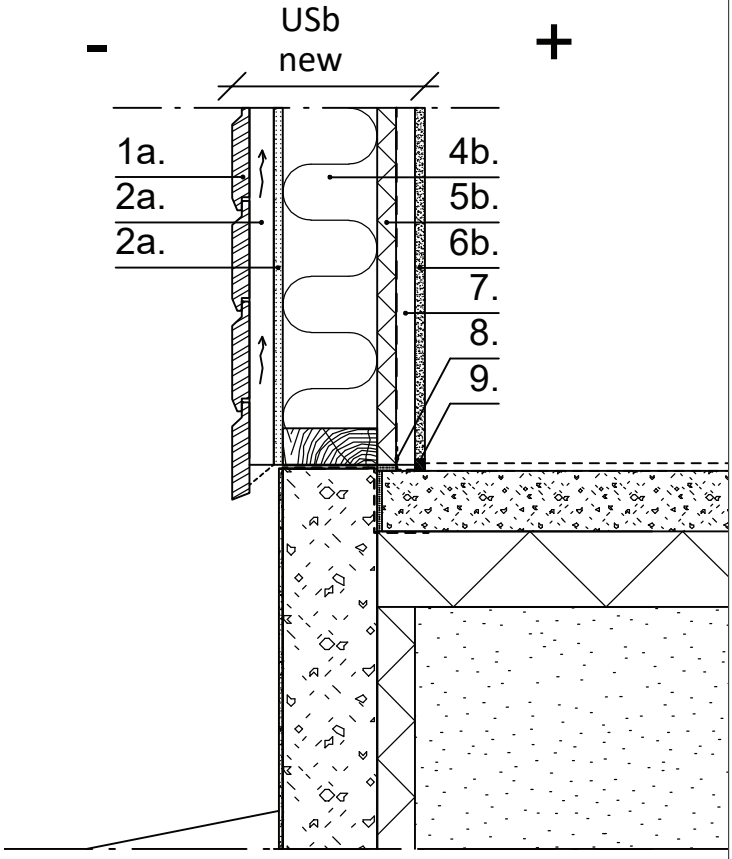
Construction site	Contents	EXTERNAL WALL AND GROUND-SUPPORTED BASE FLOOR JUNCTION:
Saint-Gobain Rakennustuotteet Oy	10c.	
APPENDIX 2: FACADE - SYSTEM INSTRUCTIONS RENOVATION	Date 08.10.2021	US - AP,mp
	revision	

A. ORIGINAL STRUCTURE



1a. External cladding
2a. Ventilation battens and air gap
3a. Woodfibre board 12 mm / close boarding 25 mm + paper
4a. Mineral wool / woodchip insulation + frame 50 mm ctrs600
5a. Vapour barrier film/paper
6a. Interior cladding (wood panelling 15 mm)

B. ADDITIONALLY INSULATED STRUCTURE



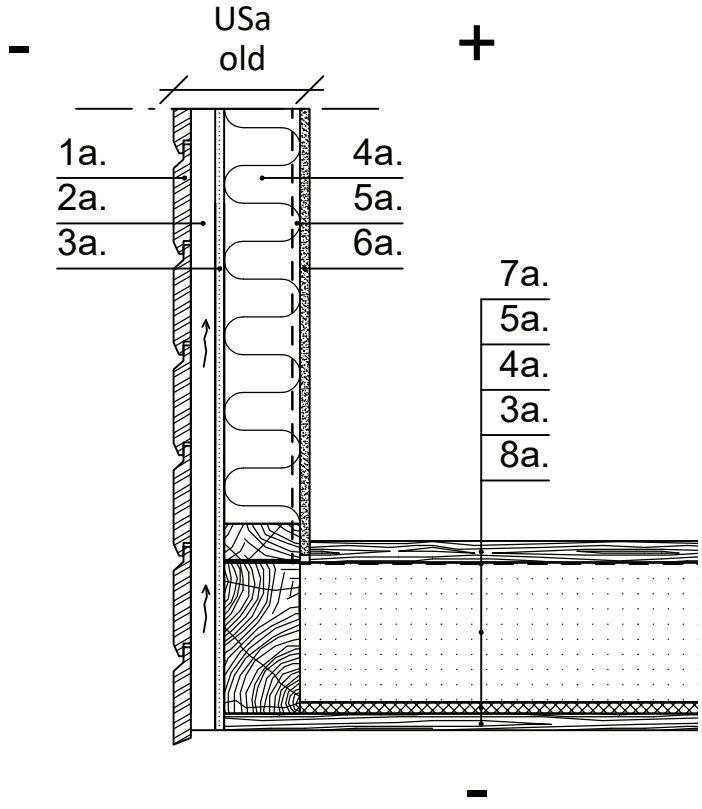
4b. New insulation with ISOVER PREMIUM 33 if necessary
5b. ISOVER InLiner/Aluliner 25 mm
- seams, bushings and joints taped
+ VARIO® Multitape SL tape /
+ VARIO® KB 1
6b. Interior cladding board Gyproc GEK 13
7. Battening 25 mm / installation space for electrification
8. ISOVER VarioBond sealing strip (75/100 mm),
9. Elastic sealant

Structure›s U value (W/m²K), when additional external thermal insulation is added to present structure		
Present structure / U value		In/AluLiner 25 mm on interior surface / U value
Woodchip insulation 100 mm.	0.56	0.40
Woodchip insulation 125 mm.	0.48	0.35
Mineral wool 100 mm.	0.39	0.30
Mineral wool 125 mm.	0.33	0.26
Structure's U value when frame insulation is replaced and thermal insulation increased		
New frame insulation	In/AluLiner 25 mm on interior surface / U value	
PREMIUM 100 mm	0.26	
PREMIUM 125 mm	0.22	

(λ_D 0.08 W/mK) used as thermal insulation capacity of woodchip insulation.
(λ_D 0.045 W/mK) used as thermal insulation capacity of old mineral wool.
Resistance of interior and exterior surface 013 m²K/W.

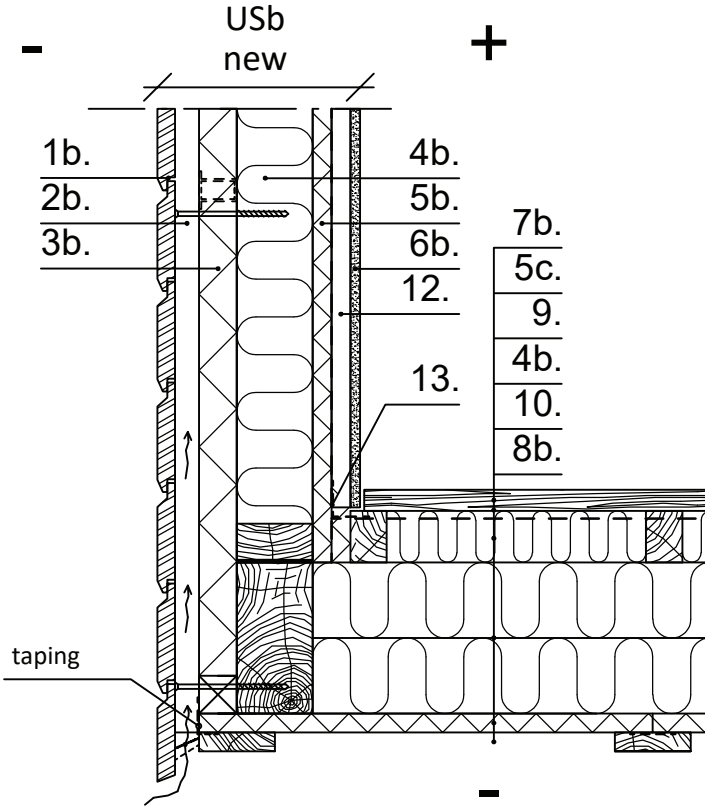
Construction site	Contents	EXTERNAL WALL AND VENTILATED BASE FLOOR JUNCTION:
Saint-Gobain Rakennustuotteet Oy	10d.	
APPENDIX 2: FACADE - SYSTEM INSTRUCTIONS RENOVATION	Date 08.10.2021	US - AP,vt
	revision	

A. ORIGINAL STRUCTURE



1a. External cladding
2a. Ventilation battens and air gap
3a. Woodchip board 12 mm / close boarding 25 mm + paper
4a. Mineral wool / woodchip insulation + frame 50 mm ctrs600
5a. Vapour barrier film/paper
6a. Interior cladding (wood panelling 15 mm)
7a. Floorboarding
8a. Support boards

B. ADDITIONALLY INSULATED STRUCTURE



1b. External cladding
2b. Ventilation battens and air gap
3b. ISOVER Facade 50 mm, seams taped
4b. ISOVER PREMIUM 33, insulation filling frame space
5b. ISOVER InLiner / AluLiner 25 mm, seams taped
5c. ISOVER Vario® Xtra, seams taped
6b. Interior cladding board Gyproc GEK 13
7b. Floorboarding
8b. Support boards 22x100 k600 (preservative treated)
9. Option: PREMIUM 100 mm / battening 50x100.
10. Isover Facade EJ 25 mm, seams taped
11. Facade Tape
12. Battening 25 mm / installation space for electrification
13. Floor vapour barrier joint taping to wall panel's vapour barrier surface

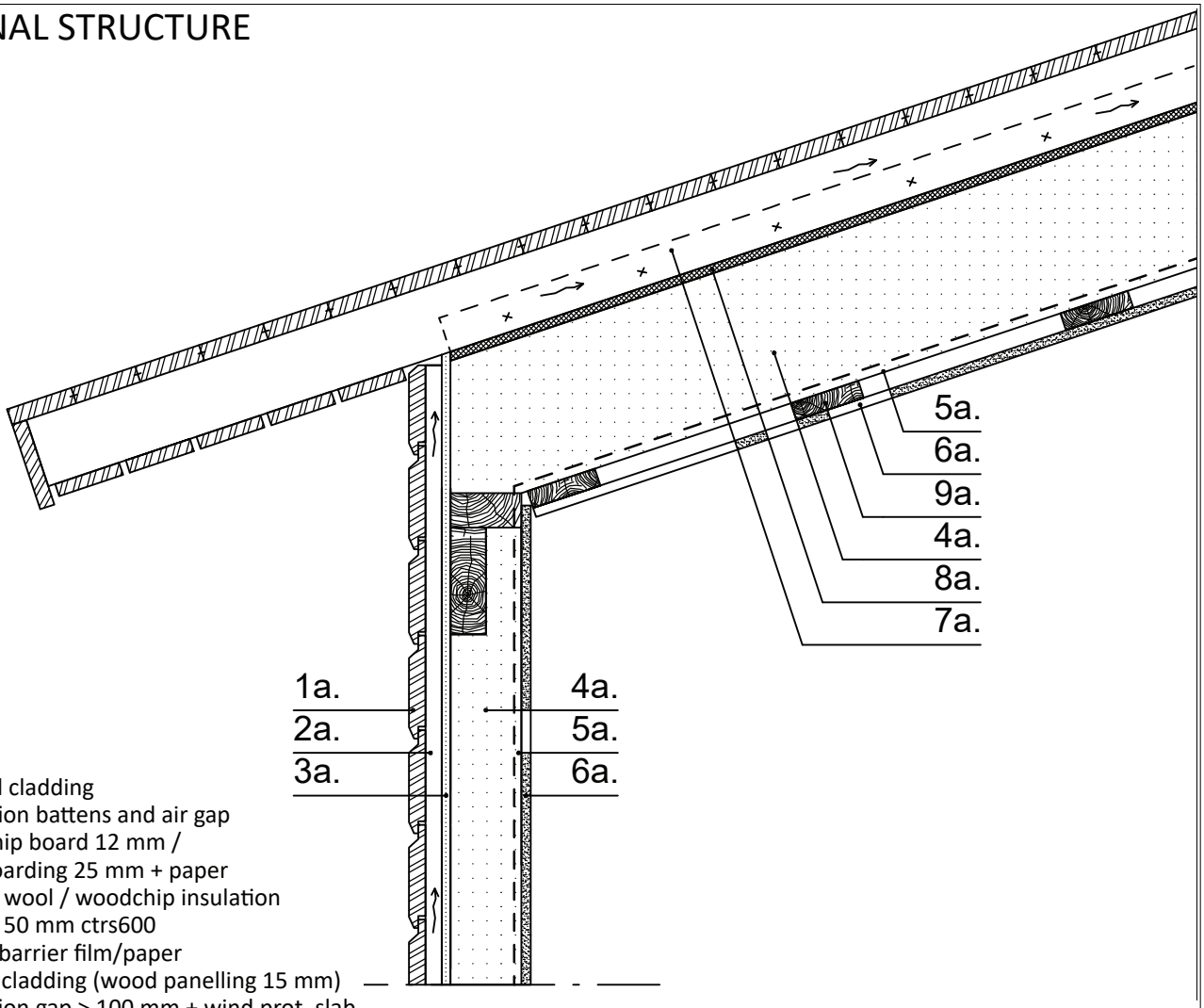
U value (W/m^{2}K) of present US structure	
Woodchip insulation 100 mm.	0.56
Woodchip insulation 125 mm.	0.48
Mineral wool 100 mm.	0.39
Mineral wool 125 mm.	0.33
U value of US structure when int. and ext.	
additionally insulated and frame insulation replaced	
PREMIUM 33 (100 mm)	0.19
PREMIUM 33 (125 mm)	0.17

U value (W/m2K) of present AP structure	
Current structure	
Wood chip insulation 200 mm.	0.32
Mineral wool 200 mm.	0.22
U value of AP structure when thermal insulation and wind protection slab are replaced	
PREMIUM 33 (200 mm) + FACADE EJ	0.16
PREMIUM 33 (100+200 mm) + FACADE Ej	0.11

(λ_D 0.08 W/mK) used as thermal insulation capacity of woodchip insulation. (λ_D 0.045 W/mK) used as thermal insulation capacity of old mineral wool. Resistance of interior and exterior surface of external wall 0.13 m^{2}K/W. Resistance of interior and exterior surface of base floor 0.17 and 0.04 m^{2}K/W.

Construction site	Contents	
ISOVER Saint-Gobain Rakennustuotteet Oy	11a.	EXTERNAL WALL AND SLANTING ROOF SLAB JUNCTION
APPENDIX 2: FACADE - SYSTEM INSTRUCTIONS RENOVATION	Date 08.10.2021 revision	US - YP,v

A. ORIGINAL STRUCTURE



1a. External cladding
2a. Ventilation battens and air gap
3a. Woodchip board 12 mm / close boarding 25 mm + paper
4a. Mineral wool / woodchip insulation + frame 50 mm ctrs600
5a. Vapour barrier film/paper
6a. Interior cladding (wood panelling 15 mm)
7a. Ventilation gap > 100 mm + wind prot. slab support battens
8a. Wind protection slab
9a. Battening

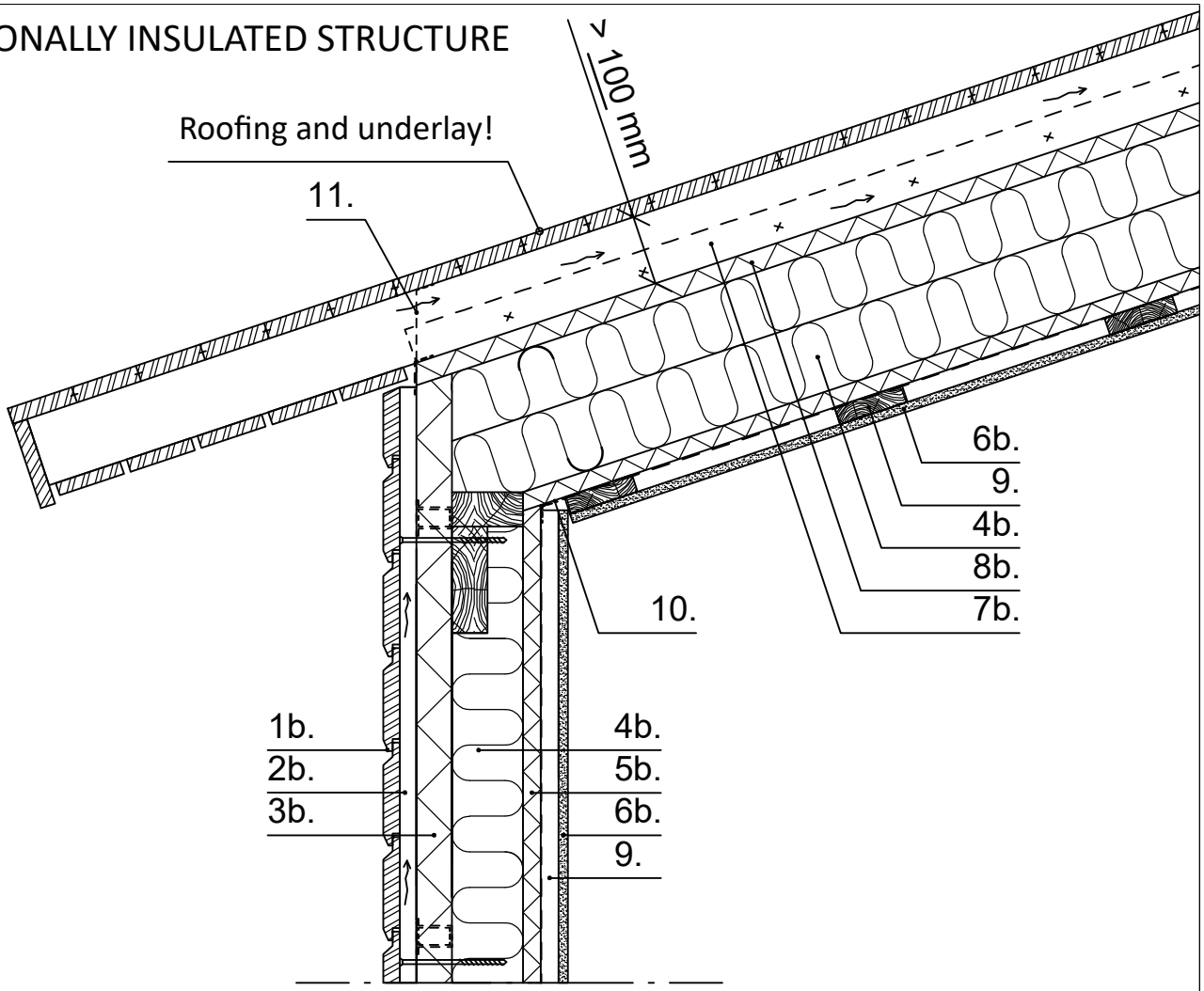
U value (W/m^2K) of present US structure	
Woodchip insulation 100 mm.	0.56
Woodchip insulation 125 mm.	0.48
Mineral wool 100 mm.	0.39
Mineral wool 125 mm.	0.33
U value of US structure when int. and ext. additionally insulated and frame insulation replaced	
PREMIUM 33 (100 mm)	0.19
PREMIUM 33 (125 mm)	0.17

U value (W/m2K) of present YP structure	
Current structure	
Wood chip insulation 200 mm.	0.34
Mineral wool 200 mm.	0.23
U value of YP structure when thermal insulation and wind protection slab are replaced	
PREMIUM 33 (200 mm) + ISOVER RKL-31 30 mm + In-/AluLiner 25 mm	0.14

(λ_D 0.08 W/mK) used as thermal insulation capacity of woodchip insulation. (λ_D 0.045 W/mK) used as thermal insulation capacity of old mineral wool. Resistance of interior and exterior surface 0.13 m^2K/W. Resistance of roof slab interior and exterior surface 0.10 m^2K/W.

Construction site	Contents	EXTERNAL WALL AND SLANTING ROOF SLAB JUNCTION
ISOVER Saint-Gobain Rakennustuotteet Oy	11a.	
APPENDIX 2: FACADE - SYSTEM INSTRUCTIONS RENOVATION	Date 08.10.2021	US - YP,v
	revision	

B. ADDITIONALLY INSULATED STRUCTURE



1b. External cladding
2b. Ventilation battens and air gap
3b. ISOVER Facade 50 mm, seams taped
- Joint sealing
  + ISOVER Facade Tape /
  + VARIO® Facade Tape
  + ISOVER VarioBond sealing strip in joints to stone structures
- RKL Termofix spacer under battening / Nail spacer

4b. ISOVER PREMIUM 33, insulation filling frame space
5b. ISOVER InLiner / AluLiner 25 mm, seams taped
6b. Interior cladding board Gyproc GEK 13
7b. Ventilation gap > 100 mm + wind prot. slab support battens
8b. ISOVER RKL 30 mm
9. Battening 25 mm / installation space for electricity
10. Vapour barrier joint taping
11. Insect / mouse net

SAINT-GOBAIN

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