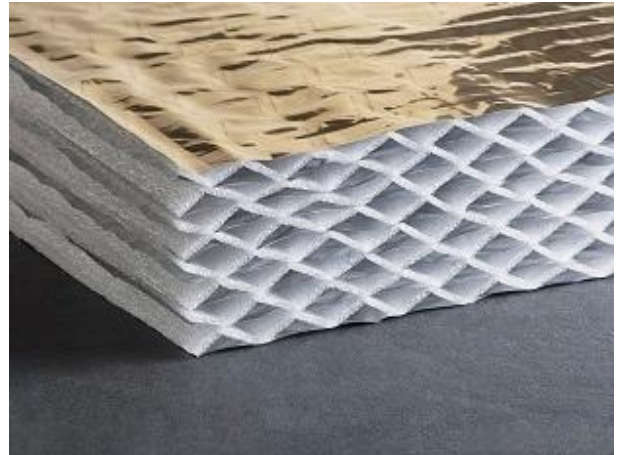


NAME OF PRODUCT

HYBRIS

MANUFACTURER

ACTIS SA
30 Avenue de Catalogne
11300 Limoux
France



PRODUCT DESCRIPTION

HYBRIS is a flexible, reflective, non-homogeneous insulation product. The product consists of an inner core of shaped polyethylene foam layers and outer surfaces made of aluminium coated polyethylene foil. The inner foam layer are interspersed with aluminium coated foils creating triangular shaped air cavities. All layers are assembled by thermo-gluing.

HYBRIS is intended to be used in roofs (pitched roofs between and under rafters, loft insulation and flat roof insulation) and walls (timber frame, masonry constructions and partition walls) and floors.

The low emissivity of the two outer faces of HYBRIS contributes to its thermal performance. Non-ventilated air gaps on the external surfaces will improve the thermal efficiency.

In most configurations, an independent and continuous vapour control layer and a breathable underlay shall be installed together with HYBRIS insulation.

CERTIFICATION PROCEDURE

This certificate has been issued by VTT Expert Services Ltd, which is a certification body (S017) accredited by FINAS.

This certificate is based on an initial type assessment of the product, an initial inspection of the factory and the factory production control according to the certification criteria VTT SERT R007 and section 2. The general certification procedures are based on the certification system of VTT Expert Services Ltd.

The conditions of validity of this certificate are described in section 14.

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REGULATIONS, STANDARDS AND INSTRUCTIONS

1 Regulations

In the opinion of VTT Expert Services Ltd, HYBRIS, if used in accordance with the provisions of this certificate, will contribute to meet the relevant requirements of the Finnish building regulations as stated in the following:

782/2017 *Ministry of the Environment Decree on the moisture performance of buildings*

848/2017 *Ministry of the Environment Decree on the fire safety of buildings*

Finnish national degree 745/2017, *Degree on the structures and fire safety of small chimneys*, gives requirements for insulation of chimney penetrations. In this certificate installation details for chimney penetrations are not presented.

PRODUCT INFORMATION

2 Product description, marking and quality control

Nominal dimensions and density of HYBRIS insulation is:

	Length and width		Density
HYBRIS insulation - mat	Width	1200 mm	9,5 kg/m ³
	Roll length	3,2 m - 8 m depending on thickness	
HYBRIS insulation - panels	Length x width ^{*)}	1200 mm x 1145 mm 2650 mm x 1150 mm	

^{*)} Other dimensions, e.g. 1325 mm x 1150 mm, 610 mm x 1200 mm, 410 mm x 1200 mm, are available upon request.

Nominal thicknesses of HYBRIS insulations are:

	Thickness, mm													
Mat		45	60	75	90	105	120		135	150				
Panel	40	50	60	75	90	105	120	125	140	155	170	185	195	205

Products are marked with product name, name of the manufacturer, dimensions of the product and manufacturing date.

Manufacturer's internal quality control consists of process control and visual inspection of the product as well as control of raw materials, product dimensions, product strength, thermal resistance and emissivity.

External quality control is carried out according to the contract on quality control between the manufacturer and VTT Expert Services Ltd.

3 Delivery and storage on site

The product is delivered to the site in free rolls or flat panels, packed in a plastic wrapping.

The product shall be stored in clean, dry conditions in such a way that dirt and dust cannot adhere to the product surfaces. The product shall be protected from being dropped or crushed. It shall also be protected from direct heat sources, sparks and open flames, and stored away from flammable materials, e.g. solvents.

DESIGN INFORMATION

4 General

The design information given in this certificate is based on the assumption that the structural solutions, fastening methods and other details given in this certificate are followed and the given requirements, instructions and standards are followed. This certificate includes structure examples, which may not be common in every country and shall be verified against national codes and regulations.

5 Installation

HYBRIS insulation product must be carefully installed side by side to ensure the continuity of insulation. For most configurations, HYBRIS should be complemented by an independent and continuous vapour control layer and breathable underlay that ensures the air tightness and good condensation risk management. Underlays and vapour barriers can be installed in direct contact with HYBRIS or there can be a non-ventilated air gap between HYBRIS and underlay/vapour control layer. If a separate vapour control layer is not used, joints between HYBRIS insulation must be sealed with an ACTIS adhesive tape in order to provide adequate continuous contact, to prevent thermal bridging and moisture movement.

When HYBRIS is installed between rafters/studs, the insulation should be cut to a width equal to the center distance between the rafters/studs plus 25 mm when using HYBRIS mat, and 5 - 10 mm when using HYBRIS panel.

The insulation can be cut with an insulation saw, standard handsaw or an electric saw, insulation knife or InsulKnife.

5.1 Roof/wall underlay installation

To protect the walls, roof structures and insulating materials, a watertight and vapour permeable underlay membrane shall be used when the underlay is installed without ventilated air gap between the insulation and the underlay. Water tightness of the joints of the roof underlay is provided by overlapping the joints by at least 100 mm.

All roofing underlay joints shall have an overlapping of at least 100 mm in roofs with slope 1:3 or more and 200 mm in roofs with slope less than 1:3. The maximum span between supports onto which the underlay shall be fastened is c/c 900 mm.

5.2 Vapour or air barrier installation

In timber-framed constructions, the installation of a vapour barrier or an air barrier layer is required. The water vapour resistance of the vapour or air barrier must correspond to the local regulations. To ensure the performance of the vapour or air barrier foil the overlaps of minimum 100 mm and tightening of joints should be applied.

The water vapour permeability of roof underlay membrane or wall wind barrier, when installed without ventilated air gaps, should be at least 5 times higher than the water vapour permeability of vapour barrier or air barrier. In this evaluation also the use of building boards shall be taken into account.

5.3 Timber frame wall installation

The wall to be insulated should be watertight and weatherproof and the surfaces to be covered should be firmly fixed, clean, dry and smooth. The thickness of insulation system depends on thermal performance requirement and once installed, the insulation thickness should be at least half of the depth of the stud measured from the inside face.

An example of HYBRIS insulation product installation in timber-framed wall construction with plasterboard finish is illustrated in Figure 1.

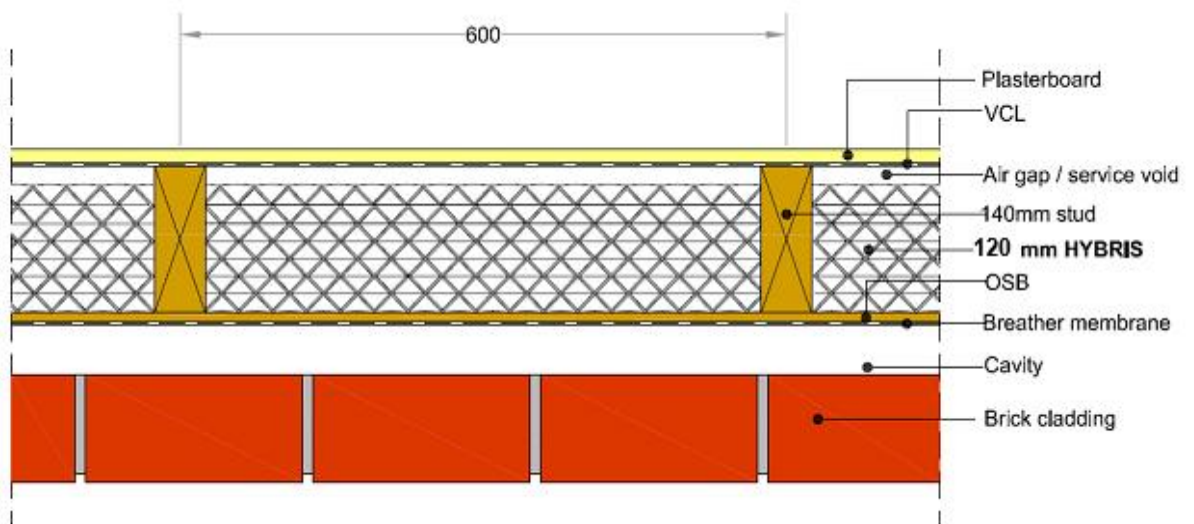


Figure 1. Typical HYBRIS installation in timber-framed wall construction

Installation details:

- HYBRIS panels are placed between the studs. The insulation is installed in one layer fulfilling the space between studs or leaving an air gap of minimum 20 mm between the HYBRIS panel and the adjacent structure.
- HYBRIS is cut to a width equal to the distance between studs plus for rolls an additional 40 mm and for panels an additional 5 - 10 mm, and to a length equal to the distance between floor and ceiling plus 10 mm. To ensure the thermal continuity it is recommended that the outer face joints of the HYBRIS panels are sealed with ACTIS adhesive tape prior to installation.
- A vapour barrier layer is stapled on to the studs and overlaps are sealed with adhesive tape. Floor and ceiling joints should be tightly sealed using appropriate sealant.
- Electric wiring, pipes and ducts should be installed in the gap between insulation material and plasterboard (cavity area). Penetrations through the insulation are sealed with ACTIS adhesive tape.
- Plasterboard is fixed to the back of the studs.

The thickness of HYBRIS is chosen according to the thermal performance requirements. In Table 1, as an example, U- and R-values of a wall with 600 mm c/c stud distance are calculated for HYBRIS insulation of 120 mm thickness with an air cavity between HYBRIS panel and vapour barrier layer.

Table 1. U-value and thermal resistance R for 120 mm thick HYBRIS installed between studs and having an air cavity between insulation and vapour barrier.

Timber frame wall - c/c distance of studs 600 mm		
Construction from indoor to outdoor	R (m ² K/W)	Thickness (mm)
Plasterboard	0,066	12,5
Vapour barrier	0	1
Stud thickness 140 mm	Non-ventilated cavity / service zone	0,455
	HYBRIS (thickness 120 mm)	3,60
OSB	0,069	9
Slightly ventilated air cavity	0,090	50
Outer cladding	0,130	100
Thermal performance - Including thermal bridge of 14 % of stud cross section of 140 mm x 50 mm		
U, W/m ² K	0,28	

5.4 Pitched roof installation

The roof to be insulated should be watertight and weatherproof and the surfaces to be covered should be firmly fixed, clean, dry and smooth. The thickness of insulation system depends on thermal performance requirement and once installed the thickness of the insulation should be at least half the depth of the rafters when measured from the inside face.

The HYBRIS can be installed in one layer (between rafters) or two layers (between and under rafters). An example of installation of two layers of HYBRIS on pitched roofs is illustrated in Figure 2.

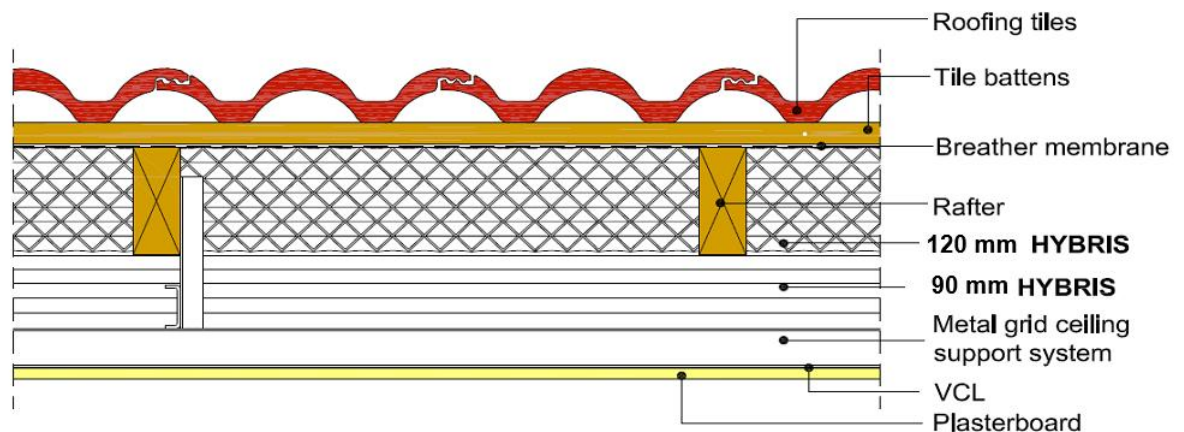


Figure 2. Typical two-layer HYBRIS installation on pitched roofs

Installation details:

- The HYBRIS can be installed in one layer (between rafters) or two layers (between and under rafters), with offset or cross joint

First layer:

- HYBRIS is cut to a width equal to the distance between rafters plus for rolls an additional 40 mm and for panels an additional 5 - 10 mm. The insulation can be installed up to underside of underlay.

- To ensure that HYBRIS is firmly held between rafters during the installation, a double face adhesive tape can be installed between the breather membrane underlay and HYBRIS either perpendicular to the rafters or parallel in the middle distance between rafters. Alternatively, the external foil of HYBRIS can be stapled to the rafters.

Second layer:

- The thickness of HYBRIS should be at least the same as the width of the rafters. The HYBRIS should not be compressed against the rafters. However, a slight compression may be tolerated.
- To install the second layer, a complementary batten or metallic frame is required. For timber batten support HYBRIS is installed perpendicular to rafters. For metallic frames HYBRIS can be installed parallel or perpendicular to rafters.
- A vapour barrier layer is stapled on to the batten support or stuck on to the metallic frame. The overlaps of the vapour barrier layers should be sealed with adhesive tape. Ceiling/wall junctions should be adequately sealed using appropriate sealant.

The thickness of HYBRIS is chosen according to the thermal performance requirements. In Table 2, as an example, U- and R-values of a roof with 600 mm c/c rafter distance are calculated for HYBRIS insulation of thickness 120 mm between rafters and 90 mm below rafters.

Table 2: U- and R-values for HYBRIS installed in between rafters in warm roof. The thermal bridge of this configuration is equal to 7,83%

Warm roof - c/c distance of rafters 600 mm			
Construction from indoor to outdoor		R (m²K/W)	Thickness (mm)
Plasterboard		0,066	12,5
Vapour barrier		0	1
Frame thickness 90 mm	HYBRIS (thickness 90 mm)	2,7	90
Rafter thickness 125 mm	HYBRIS (thickness 120 mm)	3,60	120
Water vapour permeable underlay		0	1
Ventilated air cavity		0	25
Tiles		0	17
Thermal performance			
- Including thermal bridge of 7,83 % for rafter cross section 50 mm x 200 mm; frame cross section 50 mm x 50 mm			
U, W/m ² K		0,18	

5.5 Lofts/attics installation

HYBRIS can be installed on lofts/attics in between and over ceiling joists and floor joists of timber frame structures and on continuous solid floors.

The roof to be insulated should be watertight and weatherproof and the surfaces to be covered should be firmly fixed, clean, dry and smooth. The thickness of insulation system depends on the thermal performance requirement.

The insulation can be installed in one layer laid between or over ceiling joists (see Figure 3) or two layers, with offset of cross joint.

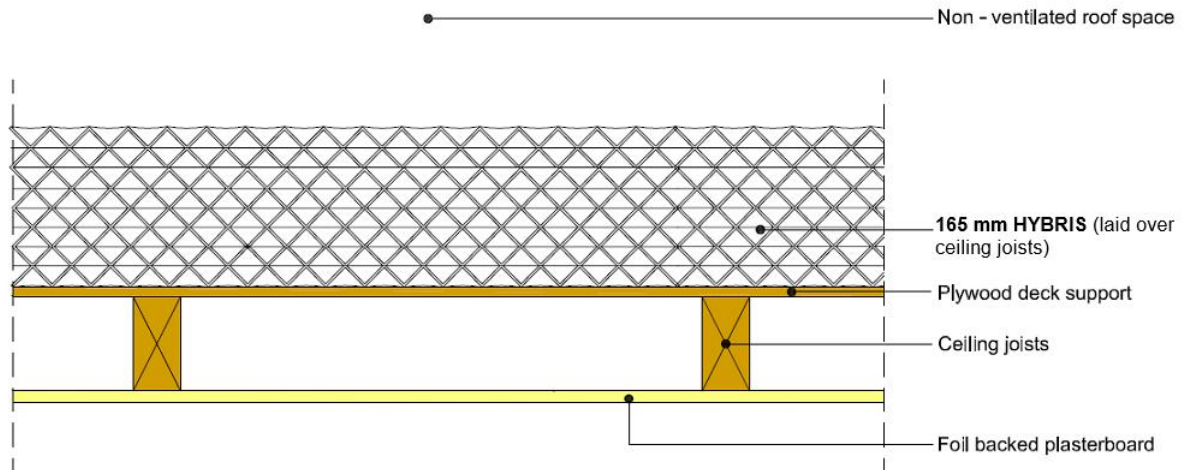


Figure 3. Typical HYBRIS installation in lofts in one layer over ceiling joists.

Installation details:

- An independent and continuous standard vapour control layer is to be installed.

Installation of the first layer:

- When the floor is composed of timber joists, the insulation is cut to a width equal to the distance between joists plus for rolls an additional 40 mm and for panels an additional 5 - 10 mm
- When the floor is continuous, HYBRIS should be laid on the floor without any air cavity and well jointed with ACTIS adhesive tape.

Installation of the second layer:

- The second layer is laid over the first one with offset or cross joints.
- The thermal insulation and vapour control layer needs to be continuous and particular care is required in sealing around penetrations and at the perimeters where roofs and walls meet.
- It is possible to walk on the HYBRIS.
- Storing loads on HYBRIS is not recommended

The thickness of HYBRIS is chosen according to thermal performance requirements. In Table 3, as an example, U- and R-values are calculated for one layer of a 165 mm thick HYBRIS insulating product installed over joists.

Table 3: U- and R-values for HYBRIS installed in lofts above joists

Loft above joists - single layer			
Construction from the floor to HYBRIS		R (m ² K/W)	Thickness (mm)
Floor		0,069	9
Unventilated loft cavity		0,444	1000
HYBRIS (thickness 165 mm)		5,00	165
Ceiling joist cavity		0,455	100
Frame thickness 90 mm	HYBRIS (thickness 90 mm)	2,7	90
Thermal performance			
U, W/m ² K		0,16	

6 Structural performance

HYBRIS is not a structural component. It is a non load bearing product. It will resist normal loads associated with installation and use.

7 Performance in relation to moisture

National degree 782/2017, Decree on the moisture performance of buildings, shall be followed in the design of the constructions taking into account the water vapour permeability and air tightness of the structures.

Water vapour permeability of the HYBRIS is presented in Table 7.

The s_d value for the most inner part of the structure shall be at least five times higher than the most outer one. This can be different in other countries related to construction regulations in effect.

8 Performance in case of fire

National degree 848/2017, Decree on the fire safety of buildings, gives requirements for fire safety of buildings and building products. National degree 745/2017, Degree on the structures and fire safety of small chimneys, gives requirements for insulation of chimney penetrations.

HYBRIS insulation is classified to reaction to fire class F according to Commission Delegated Regulation (EU) 2016/364.

9 Thermal insulation performance

The thermal performance of HYBRIS has been measured according to the standard EN 12667. Results are given in Tables 4 and 5.

Table 4: Thermal performance of HYBRIS mat

Thickness [mm]	Declared thermal resistance [m ² K/W]	Thickness [mm]	Declared thermal resistance [m ² K/W]
45	1,35	105	3,15
60	1,80	120	3,60
75	2,25	135	4,05
90	2,70	150	4,50

Table 5: Thermal performance of HYBRIS panels

Thickness [mm]	Declared thermal resistance [m ² K/W]	Thickness [mm]	Declared thermal resistance [m ² K/W]
40	1,20	125	3,75
50	1,50	140	4,20
60	1,80	155	4,65
75	2,25	170	5,15
90	2,70	185	5,60
105	3,15	195	5,90
120	3,60	205	6,20

The emissivity of HYBRIS outer surfaces has been determined according to EN 16012. The results are given in Table 6.

Table 6: Declared emissivity of HYBRIS

HYBRIS declared emissivity	
Front side (copper coloured)	Back side (silver coloured)
0,06	0,10

Thermal resistance of air cavities can be calculated according to EN ISO 6946.

HYBRIS has reflective faces. Applying the non-ventilated air gap is more advantageous for these products. When the metallised face of the product faces a 20 mm cavity, the product will provide additional thermal resistance which can be incorporated into U-value calculations carried out in accordance with EN ISO 6946.

When applicable, the dimensions of timber battens should be determined carefully in order to achieve the minimum air cavity width of 20 mm.

10 Sound insulation / Acoustical performance

Performance of HYBRIS as sound insulation has not been determined.

11 Durability

Resistance to tearing, tensile strength parallel to faces, shear resistance of joint with ACTIS tape and peel strength of ACTIS tape have been measured before and after ageing at 70 °C and RH 90 % for 28 days. The ageing did not affect the declared values.

INSTRUCTIONS FOR INSTALLATION AND USE

12 Manufacturer's instructions

Installation should be carried out in accordance with the manufacturer's instructions. The instructions shall be carefully followed in order to achieve the intended functional performance of the construction.

TECHNICAL SURVEY

VTT Expert Services Ltd has performed evaluation based on manufacturer's documentation, test results and calculations. Summary of product characteristics is presented in Table 7.

Table 7. A summary of product characteristics of HYBRIS insulation

Characteristics	Test method	Unit	Declared value
Thickness	EN 823	mm	Mat: 45/60/75/90/105/120/135/150 Panel: 40/50/60/75/90/105/120/ 125/140/155/170/185/195/205
Density	EN 1602	kg/m ³	9,5 ± 1
Length	EN 822	m	roll 3,2 - 8 panel 1,2 and 2,65
Width		mm	mat 1200 panel 1145 and 1150
Declared thermal resistivity, see Table 4			
Declared emissivity	EN 16012	-	0,06/0,01 (front/back side)
Specific heat capacity	DSC	KJ/kgK	2,3
Tensile strength			
Longitudinal direction	EN 1608	kPa	65
Transversal direction		kPa	48
Product with the tape		N/100 mm	116
Resistance to tearing, nail shank			
Longitudinal direction	EN 12310-1	N	190
Transverse direction		N	180
Peel strength of tape	EN ISO 11339	N/100 mm	22 (adhesion failure)
Water vapour transmission			
Permeance (W)	EN ISO 12572 set C	kg/m ² sPa	2,11·10 ⁻¹²
Vapour resistance (Z)		m ² sPa/kg	470·10 ⁹
Diffusion eq. air layer thickness (s _d)		m	90
Fire resistance	EN ISO 11925-2	class	F
After ageing			
Tensile strength			
Longitudinal direction	EN 1608	kPa	74
Transverse direction		kPa	52
Product with tape		N/100 mm	132
Resistance to tearing, nail shank			
Longitudinal direction	EN 12310-1	N	199
Transverse direction		N	188
Peel strength of tape	EN 11339	N/100 mm	At 98 the HYBRIS surface is torn

VALIDITY OF THE CERTIFICATE

13 Validity period of the certificate

This certificate is valid until May 29, 2023.

Real time information about the validity of the certificate can be found on www.vtt-todistus.fi.

14 Conditions of validity

The certificate is valid assuming that no fundamental changes are made to the product, and that the manufacturer has a valid contract on quality control/certification.

15 Other conditions

The references made in this certificate to standards and instructions are valid in the format used at the time the certificate was signed.

The recommendations in this certificate concerning the safe use of this product are minimum requirements that shall be satisfied when using the product. The certificate does not override current or future requirements imposed by laws and statutes. In addition to the issues presented in this certificate, design, manufacturing and use shall follow appropriate construction methods.

The manufacturer is in charge of the product's quality and factory production control. In awarding this certificate, VTT Expert Services Ltd does not bind itself to indemnification liability concerning personal injury or other damage that may directly or indirectly result from using the product described in this certificate.

VTT Expert Services Oy finds HYBRIS to be suitable for use in construction as described in this certificate.

This updated certificate VTT-C-9432-13 (issued first on February 12, 2013) has been granted as described above to ACTIS SA.

On behalf of VTT Expert Services Ltd on May 30, 2018

Tiina Ala-Outinen
Business Manager

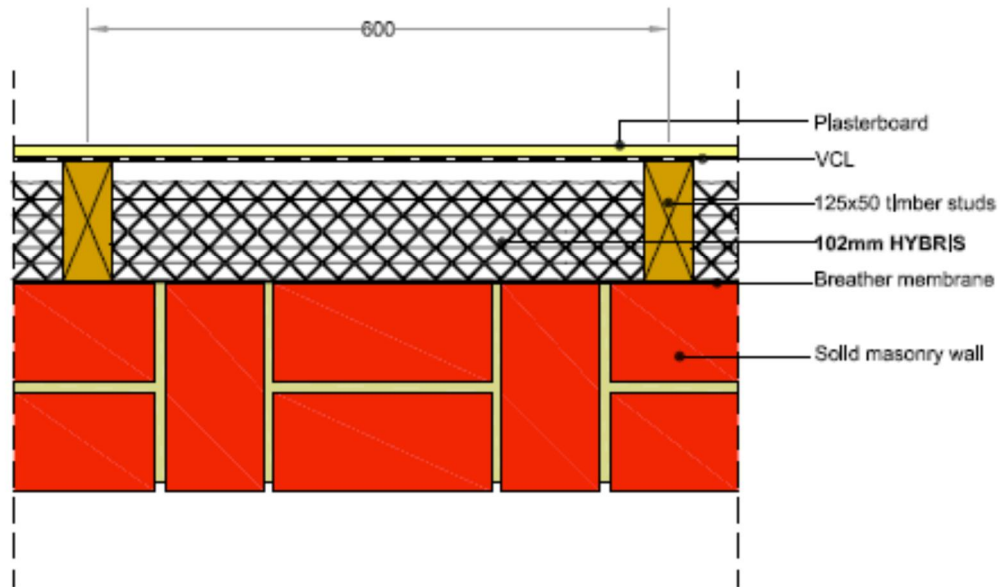
Tiina Tirkkonen
Senior Expert

This document has been signed electronically

APPENDIX A

More wall examples

Installation of HYBRIS in masonry walls



Solid wall 8 : 125mm timber studs
102mm HYBRIS
U-VALUE = 0.28 W/m²K