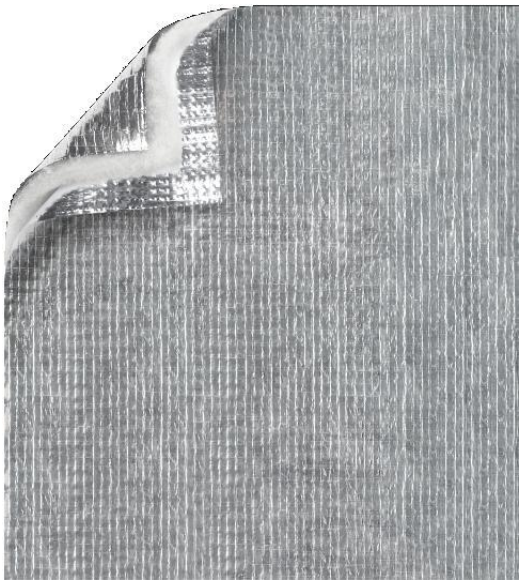
VTT EXPERT SERVICES LTD

CERTIFICATE No VTT C-6044-10

Date of issue, October 11,2010 Updated, February 4, 2011

NAME OF PRODUCT

H-CONTROL REFLEX+ reflective insulating vapour control layer for roof and wall applications



MANUFACTURER

ACTIS S.A
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11300 Limoux
France

PRODUCT DESCRIPTION

H-CONTROL REFLEX+ is a vapour barrier which also acts as a complementary insulating material due to its thermal resistance value and high reflective properties.

H-CONTROL REFLEX+ is manufactured from two metal coated reinforced polyolefin films and one polyester fibre wadding which are fastened together by using either three strips of glue in the edges and middle or one strip of glue in the middle and thermal welding on the edges.

The width of H-CONTROL REFLEX+ is 1,6 m and its thickness is 8.5 mm. The product is packaged in rolls containing 50 m².

The product is installed from the inside of the room and can be in direct contact with the thermal insulation. To ensure a maximum thermal efficiency, it is recommended to leave at least 20 mm of air gap between the product and the other parts of the structure (e.g. of gypsum plasterboards, thermal insulation).

CERTIFICATION PROCEDURE

This certificate is based on an initial type assessment of the product, and an inspection of the internal quality control. The general certification procedures are based on the certification system of VTT Expert Services Ltd.

This certificate is valid at the most until October 10, 2015. The conditions of validity are described in section 17.

TABLE OF CONTENTS

REGULATIONS, STANDARDS AND INSTRUCTIONS

1. Regulations and product requirement standards

1.1 In the opinion of VTT Expert Services Ltd H CONTROL REFLEX + insulating vapour barrier, 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:

C2	Moisture, Regulations and Guidelines 1998, in accordance with clause 9 of this certificate
C3	Thermal insulation in a building, Regulations 2007 in accordance with clause 10 of this certificate
C4	Thermal insulation, Guidelines 2003, in accordance with clause 10 of this certificate
E1	Structural fire safety in buildings, Regulations and Guidelines 2002, in accordance with clause 11 of this certificate.
EN 13984	Flexible sheets for waterproofing. Plastic and rubber vapour control layers. definitions and characteristics

2. Other standards and instructions

2.1 The certificate holder has declared, that the following general recommendations are followed:

RIL 107, 2000 Guidance for water and moisture insulation of constructions.

PRODUCT INFORMATION

3. Product description, marking and quality control

3.1 H-CONTROL REFLEX + is a reflective water vapour barrier and consists of 3 separate elements : 2 reflective films and one wadding layer.

3.2 The dimensions and weights of the products are as follows:

Property	Unit	H-CONTROL REFLEX+
Nominal thickness	mm	8.5
Nominal weight	g/m^2	310
Roll length	m	31.25
Width	mm	1600

3.3 The product will be marked according to the provisions in EN 13984.

3.4 Internal quality control consists of process control and visual inspection of the product, thickness, weight per square meter, strength controls of the product and its raw materials, thermal resistance, emissivity of the external faces and water tightness.

3.5 External quality controls are carried out by VTT Expert Services Ltd according to a separate quality control contract.

4. Delivery and storage on site

4.1 The rolls are delivered to the site wrapped in a plastic packaging and put in a pallet. Each pallet or roll is labelled with the product name and its type, the name of the manufacturer, the name of the certificate holder if different and the dimensions of the product.

4.2 The rolls should be stored in clean, dry conditions not exposed to sunlight in such way that dirt and dust cannot collect into the product surfaces. The product must be protected from being dropped or crushed by objects. The product must not be exposed to open flame or other ignition sources and must be stored away from flammable material such as solvents.

DESIGN INFORMATION

5. General

5.1 The design data given in this certificate is based on the assumption that construction solutions, fastening methods and other details given in this certificate will be followed together with the mentioned requirements, guidelines, standards and instructions.

6. Installation

6.1 The H-CONTROL REFLEX+ insulating vapour barrier product is installed from the inside of the room. It shall be installed and fixed vertically or horizontally (see figure 1 and figure 2) according to the instructions of the certificate holder. However, when allowed by the span between supports, the vertical installation is easier. Installation can be performed in ordinary temperature conditions for building works. All vapour barrier joints shall have an overlapping of at least 50 mm and should be sealed with ACTIS MULTIDHESIF tape recommended for the product.

6.2 The H-CONTROL REFLEX+ must not be in contact with the chimney. Tightening around chimney shall be done with a heat resistant material. (See also annex A)

6.3 The product is fastened with corrosion protected nails or staples with a minimum length of 10 mm. Maximum staple distance along the edges is 100 mm. After stapling the overlaps are covered by ACTIS MULTIDHESIF tape to guarantee the tightness of the vapour barrier.

6.4 Tightening of the joints around openings like roof windows and ventilation pipes shall be done with the adhesive tape to guarantee the tightness of the vapour barrier. The joint between vertical walls and the floor should be made with a sealing mastic. Particular attention should be paid to tightening of penetrations through the vapour barrier (see Annex A for more details).

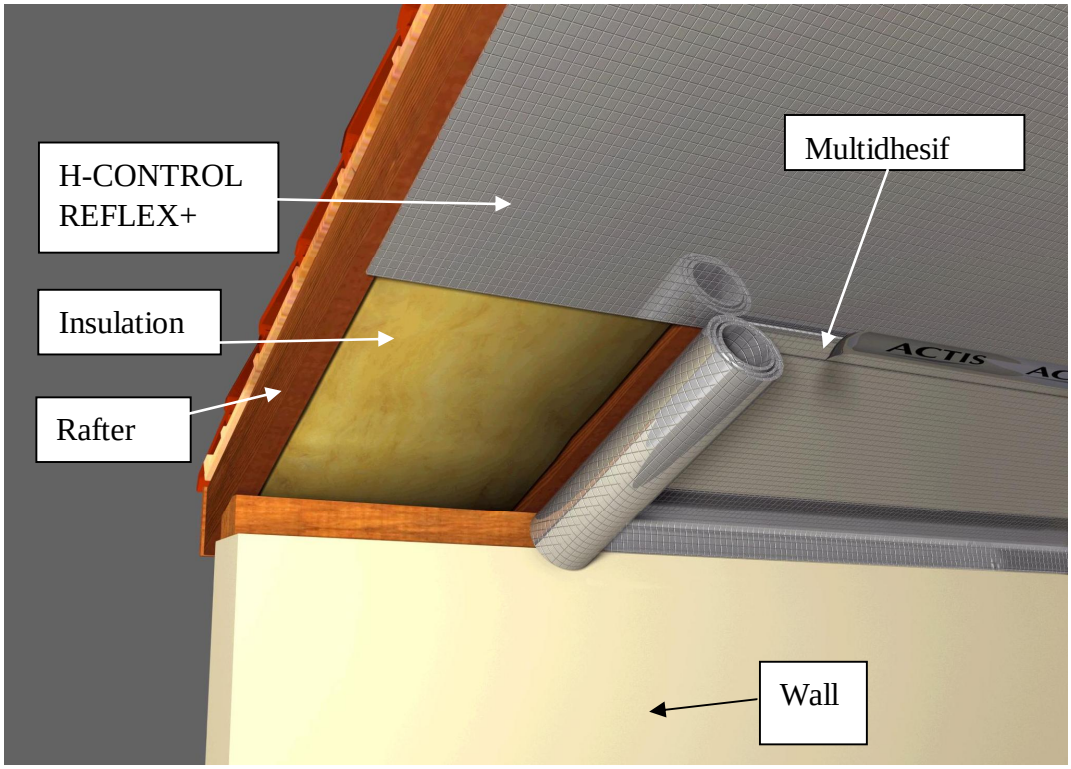

Figure 1: Example of horizontal installation

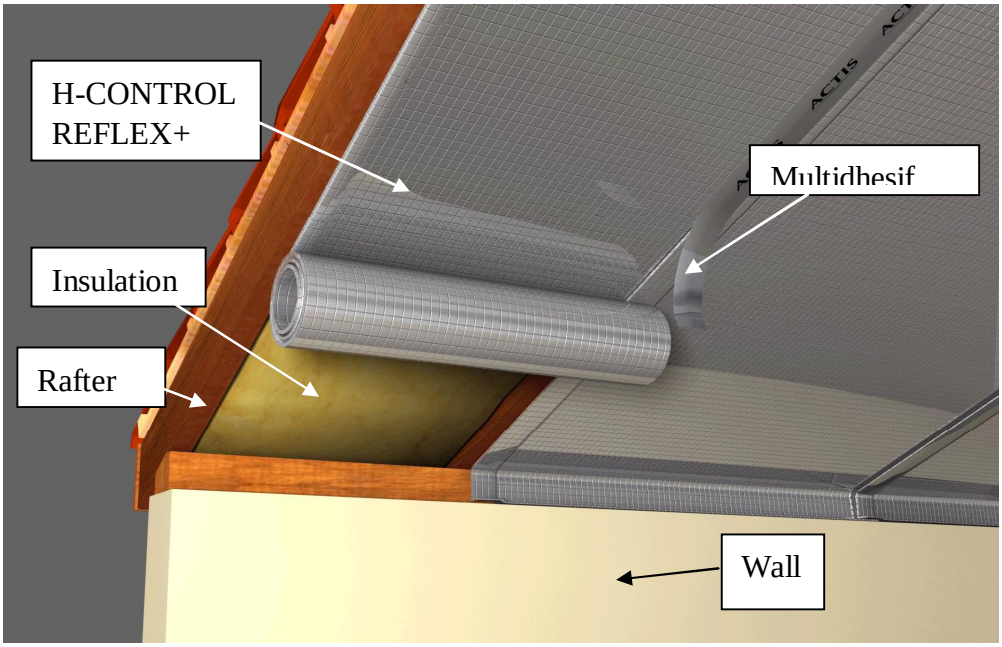

Figure 2: Example of vertical installation

6.5 In the case of horizontal installation, using intermediate supports between rafters is advised. The H-CONTROL REFLEX+ is stapled every 50 mm on the intermediate support. After stapling the overlaps must be covered by designed ACTIS adhesive tape in such a way that the tape coats the staples to ensure air tightness. For better results, the overlaps should be stapled after discarding the board of the external film. After stapling, the external film is repositioned on the stapling area and covered by MULTIDHESIF tape (Figure 3).

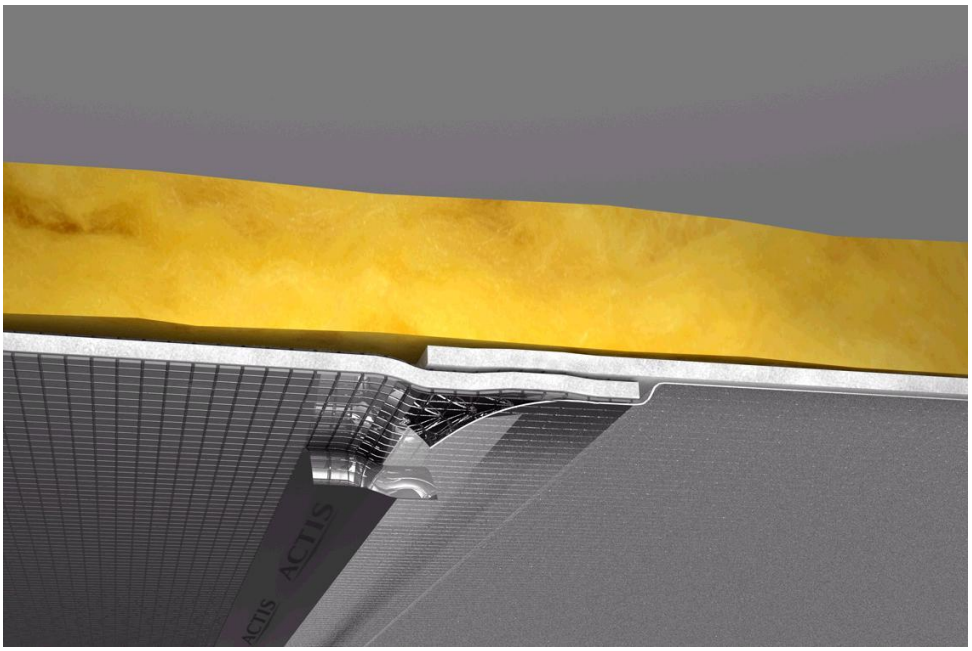

Figure 3: Overlaps in horizontal installation

7. Structural performance

H-CONTROL REFLEX+ is a non load bearing product. It will resist to normal loads associated with installation and use. The products do not resist walking.

8. Sound insulation/Acoustical performance

8.1 Influence of H-CONTROL REFLEX+ on the sound insulation properties of the constructions has not been evaluated.

9. Moisture behaviour

9.1 National Building Code of Finland, C2, Moisture, Regulations and instructions 1998 shall be followed in the design of the constructions taking into account the water vapour permeability of the vapour barrier.

9.2 H-Control Reflex+ will participate to minimize the risk of interstitial and surface condensation. It has a water vapour permeability value lower than $1{,}1*10^{-12}$ kg/(m²sPa) (see table 2).

10. Thermal behaviour / insulation

10.1 National Building Code of Finland, C3, Thermal Insulation regulations and C4 Guidelines give limits of the thermal resistances of the constructions and air tightness of the constructions.

10.2 H-CONTROL REFLEX+ has reflective faces on both sides. According to the standard ASTM C 1371-04A the emissivity of the two faces is 0,09.. The thermal performance of H-CONTROL REFLEX+ in different configurations is given in Table 1.

Table 1. Thermal performance of H-Control Reflex+. These values could be added in total R value of insulating system.

Configuration	R-value (m²K/W)		
	Horizontal flow	Vertical flow	
		Up	Down
H-CONTROL REFLEX+ without air gap	0,250		
H-CONTROL REFLEX+ with two 20 mm air gaps*	1,420	1,082	1,420
H-CONTROL REFLEX+ with one 20 mm air gap*	0,835	0,666	0,835

* the air gap thermal resistance has been calculated according to EN6946 with the following parameters : H-Control Reflex + emissivity = 0.09, surface facing the H-Control Reflex+ emissivity = 0.9, average temperature = 10°C, temperature difference = 5°C

10.3 For constructions incorporating a number of non-ventilated cavities and a low overall U value, convective and radiative heat transfer across cavities can be less than those received with the method in EN ISO 6946. The results of guarded hot box testing (EN 8990) of H-CONTROL REFLEX+ with two air gaps of 20 mm was 1.74 m^2K/W thermal resistance.

11. Fire safety

11.1 National Building Code of Finland, E1, Structural fire safety in buildings, Regulations and guidelines 2002, give requirements for fire safety of buildings and building products.

11.2 H-Control reflex + is classified Class F according to standard EN ISO 11925-2 as no performance was determined.

12. Durability

12.1 Ageing behaviour of H-CONTROL REFLEX+ is tested according to requirements of the standard EN13984, "Flexible sheets for waterproofing. Plastic and rubber vapour control layers. Definitions and characteristics". The results are in the table 1.

12.2 H-CONTROL REFLEX+ is rot-proof, does not tear easily and when installed as specified, will have a durability like other products meeting the criteria in the standard EN 13984.

INSTRUCTIONS FOR INSTALLATION AND USE

13. Manufacturer's instructions

13.1 Installation is performed according to the instructions of the manufacturer. The instructions should be carefully followed in order to achieve the intended functional performance of the construction.

TECHNICAL ASSESSMENT

14. Testing and analysis for this certificate

14.1 VTT Expert Services Ltd has performed tests concerning properties of H-CONTROL REFLEX+ vapour barrier. The results are presented partly in the text and partly in the table 2.

Table 2. A summary of test results of H-CONTROL REFLEX+ vapour barrier

Property	Test method Test conditions	Unit	Test results
Dimensions			
- length	EN 1848-2	[mm]	**9520**
- width		[mm]	**1600**
- straightness		[mm/10 m]	< **10**
- weight / m^2	EN 1849-2	[g/m^2]	**353**
-thickness	EN 1849-2 (under 50 Pa load)	mm	**8.5**
Visible defects	EN 1850-2	-	**No**
Watertightness	EN1928 and EN 13984- (200 mm H_2O+methylene blue indicator / 24h)	-	**Watertight**
Water vapour permeability, W	EN 1931, condition C; (+23 ^oC, 0 % / 75 % R.H.)	[kg/m^2sPa]	**11** x 10^{-13}
Tensile strength			
- longitudinal direction	EN12311-2 and EN 13859:, appendix A	[N/50 mm]	**456**
- transverse direction			**345**
Elongation			
- longitudidal direction	EN12311-2 and EN 13859:, appendix A	[%]	**27**
- transverse direction			**23**
Resistance to tearing (nail shank)			
- longitudinal direction	EN 12310-1 and EN 13859 appendix B	[N]	**317**
- transverse direction			**260**
Resistance to impact	EN 12691, drop height 300 mm	∅ mm/300 mm	**10 / 300**
Joint strength	EN 12317-2 (with adhesive tape)	N/50 mm	**125**
Durability after exposure to artificial ageing	EN 1296: +70 ^oC, 12 weeks + water vapour permeability		
Water vapour permeability after artificial ageing, W	EN 1931, condition C; (+23 ^oC, 0 %/75 % R.H.)	[kg/m^2sPa]	**11** x 10^{-13}
Thermal resistance with 2 air gaps	EN 8990	m^2K/W	**1.74**
Core thermal resistance	EN 12667	m^2K/W	**0.25**
Emissivity of external films	ASTM C 1371-04A	-	**0,09**

15. Other materials

To tight the joint of two layers, the corrosion protected nails and staples must be applied. The fixation by staples or nails must be completed by ACTIS adhesive tape recommended for H-CONTROL REFLEX+.

VALIDITY OF THE CERTIFICATE

16. Validity period of the certificate

This certificate is valid at the most until October 10, 2015.

17. Conditions of validity

The certificate is valid assuming that no fundamental changes are made to the product, and that the manufacturer has a valid quality control contract. A list of valid certificates is available from VTT Expert Services Ltd.

18. Other conditions

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

The recommendations in this certificate concerning the safe use of this product are minimum requirements that should 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 should 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 Ltd finds H-CONTROL REFLEX + vapour barrier to be suitable for use in construction as described in this certificate. This certificate no. VTT-C-6044-10 has been awarded as described above to ACTIS SA

On behalf of VTT Expert Services Ltd on February 4,.2011

Lina Markelin-Rantala
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APPENDIX A:

I. Roof applications

I.1 Installation procedure

The product is laid under the rafters or the battens and fixed using corrosion-resistant staples or nails. Figures 4 to 7 present some examples of H-CONTROL REFLEX+ installation.

a) Insulation has the same thickness as the rafters

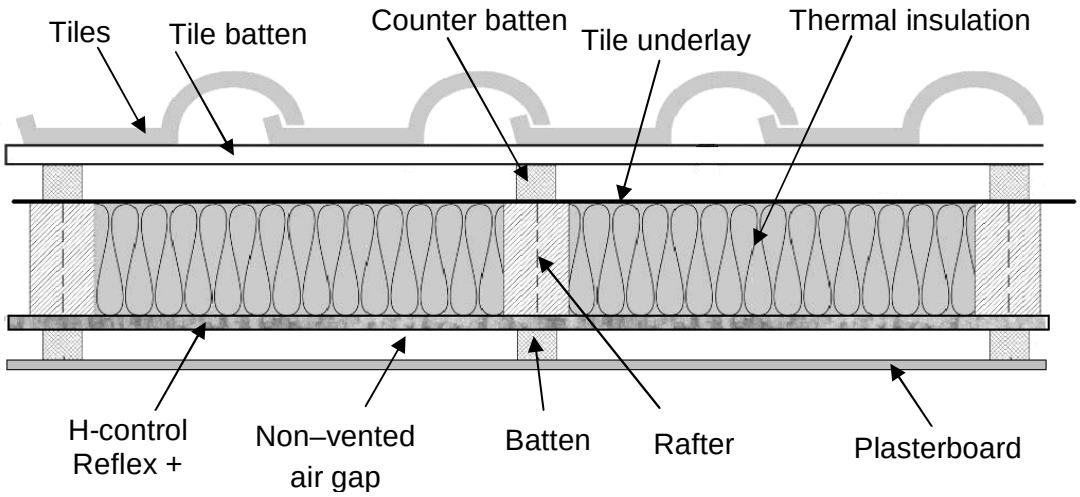

Figure 4: Installation in contact with insulation with one 20 mm air gap between HCONTROL-REFLEX + and finishing panel

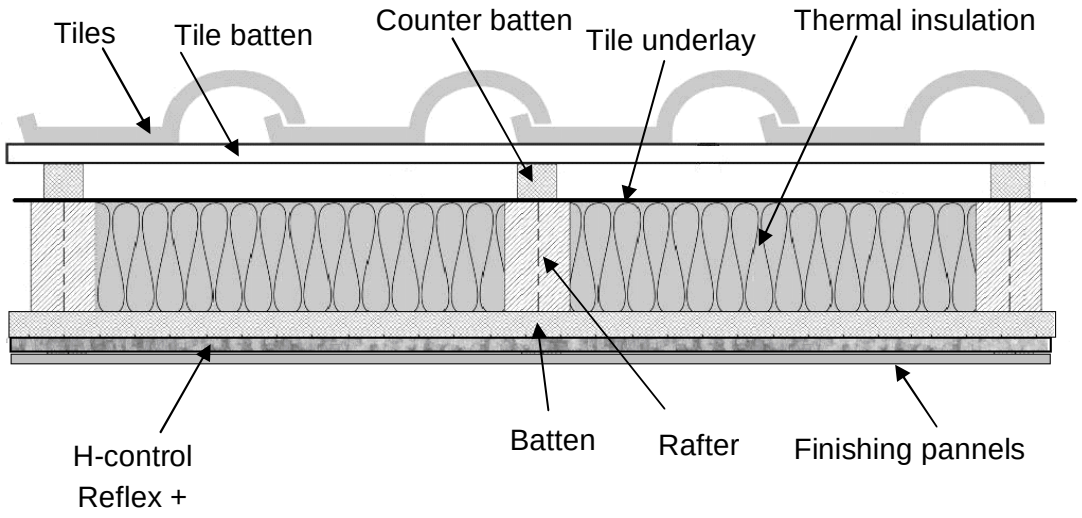

Figure 5: Installation in contact with the finishing panel with one air gap between H-Control Reflex+ and thermal insulation

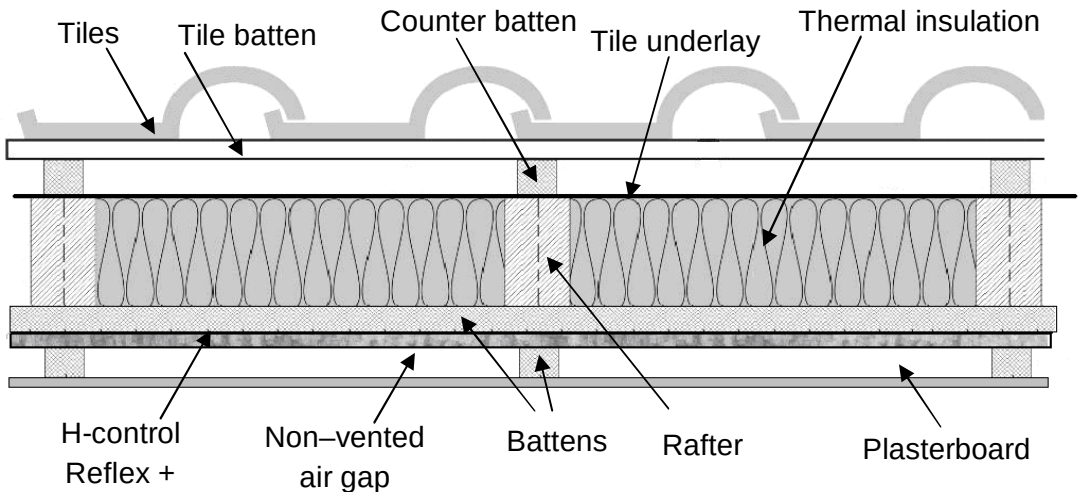

Figure 6: Installation with two air gaps

b) Insulation is less thicker than the rafters

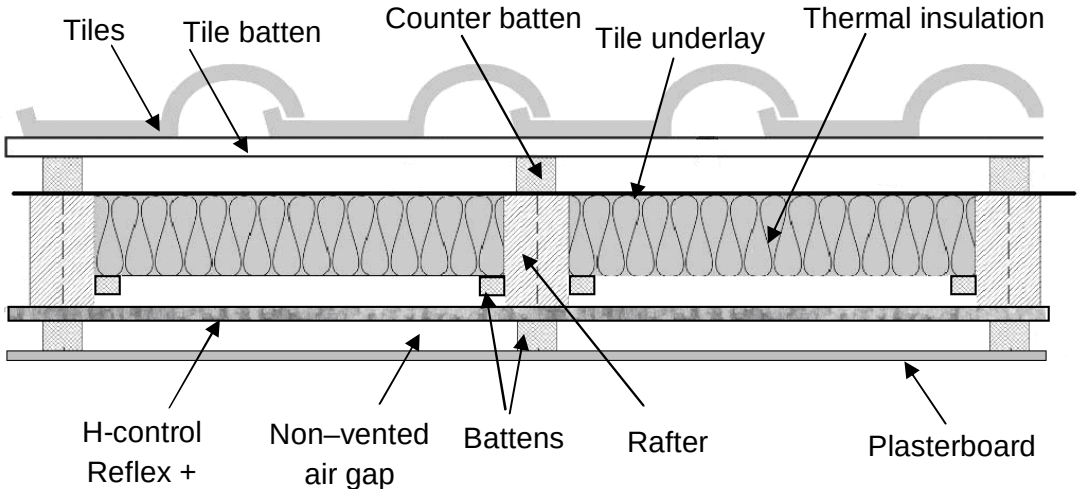

Figure 7: Installation with two air gaps

II. Wall applications

The product is installed on timber studs or on wood battens using corrosion-resistant staples or nails. In the case of installation on metal frame, double sided tape should be used. The upper layers should be lapped of 50 mm over lower layers. Figures 10 and 11 present some examples of H-CONTROL REFLEX+ installation.

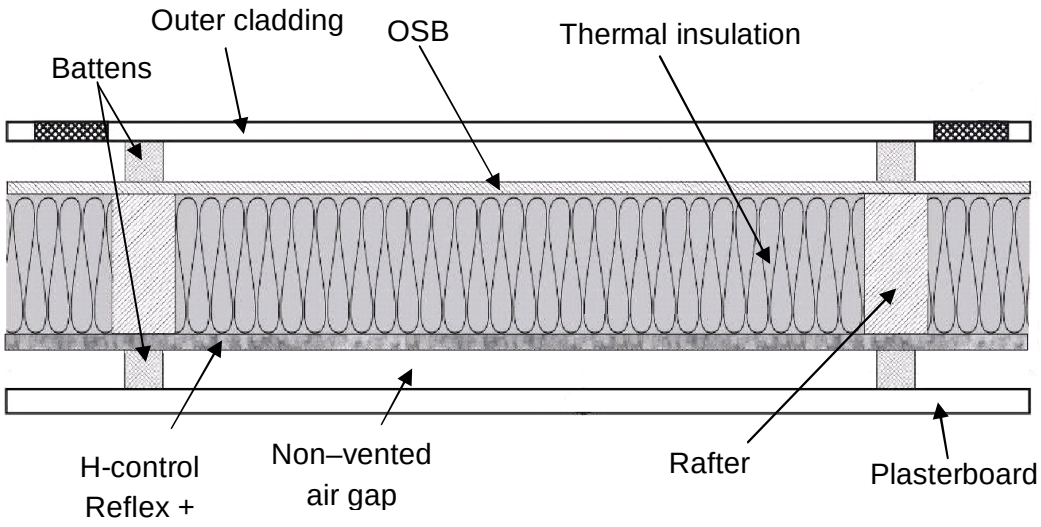

Figure 8: Wall installation in contact with the insulation with one 20 mm air gap between HCONTROL-REFLEX + and finishing panel

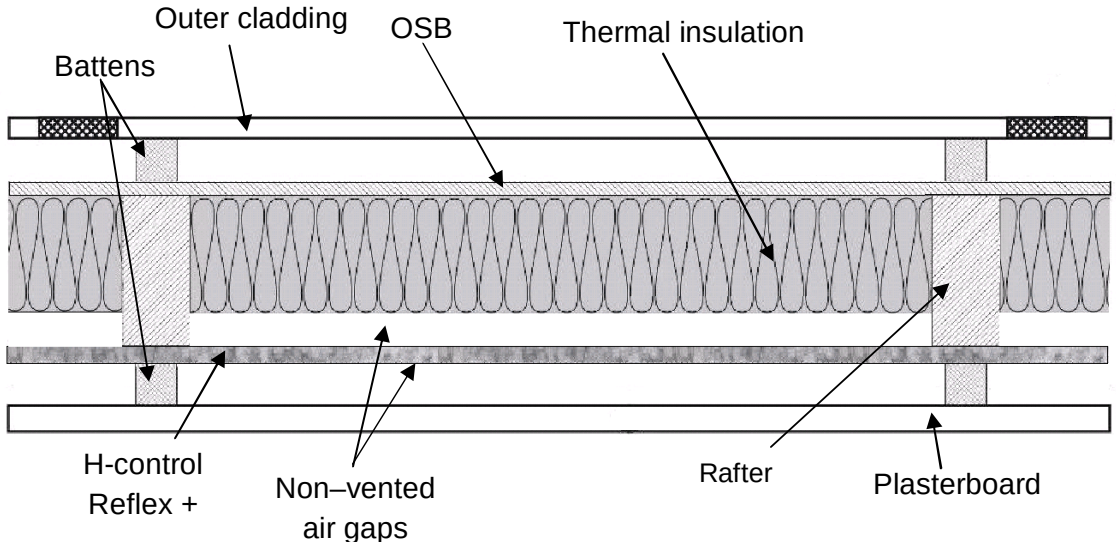

Figure 9: Wall installation with 2 air gaps

III. Floor applications

The product is installed on timber structure using corrosion-resistant staples or nails. In the case of installation on metal frame, double sided tape should be used. The upper layers should be lapped of 50 mm over lower layers. Figures 13 and 14 present some examples of H-CONTROL REFLEX+ installation.

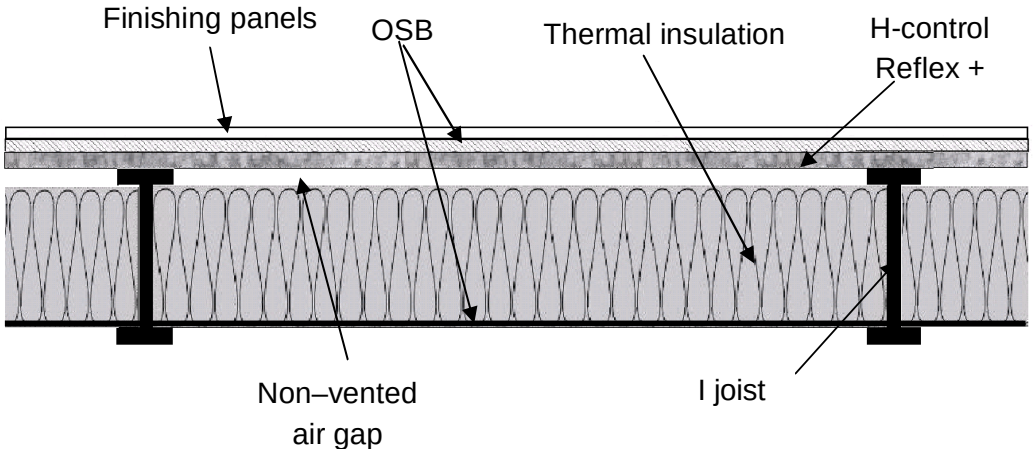

Figure 10: Floor installation with one air gap

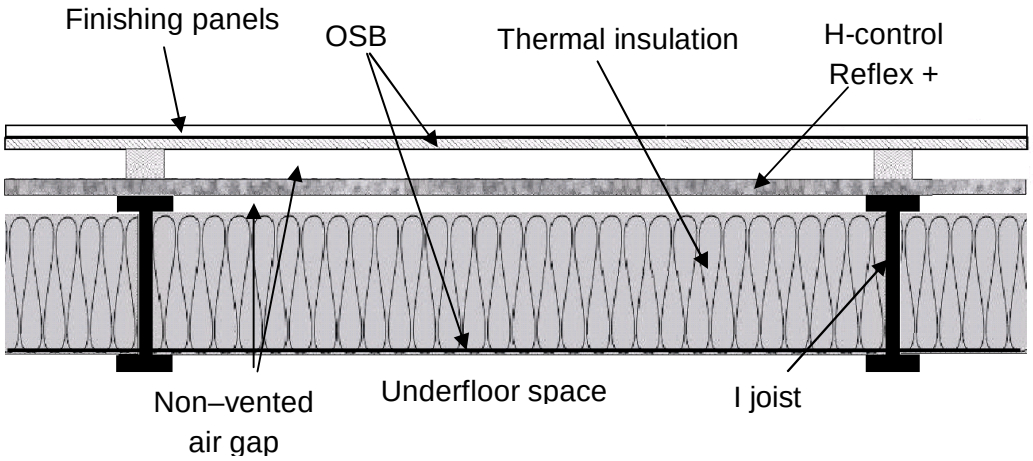

Figure 11: Floor installation with two air gaps

IV Installation details

The following drawings display the details of the vapour barrier joining to the particular parts of roof and wall structures.

a. Ducting transition through the vapour barrier

To ensure a good tightness in a ducting transition area, one way is to make a small hole into the vapour barrier and cut the edge as shown in figure 12. The vapour barrier can then be sealed to the duct by using the Actis adhesive tape.

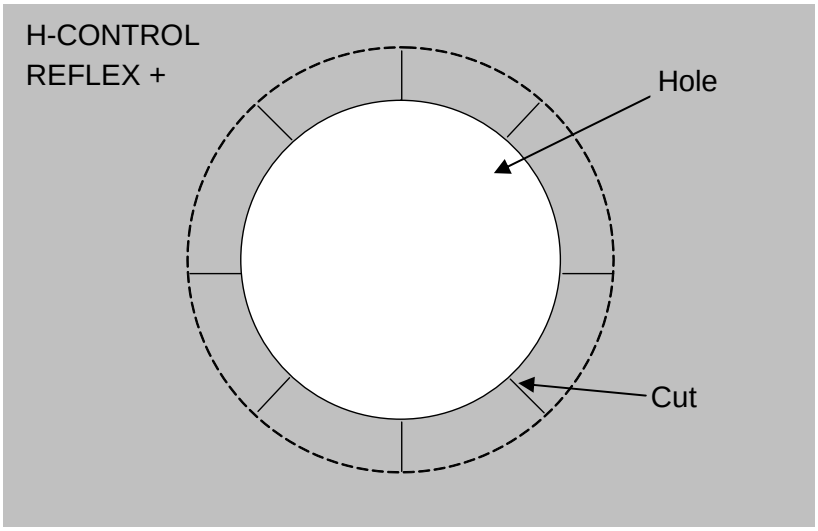

Figure 12: Ducting transition through the vapour barrier

b. Chimney

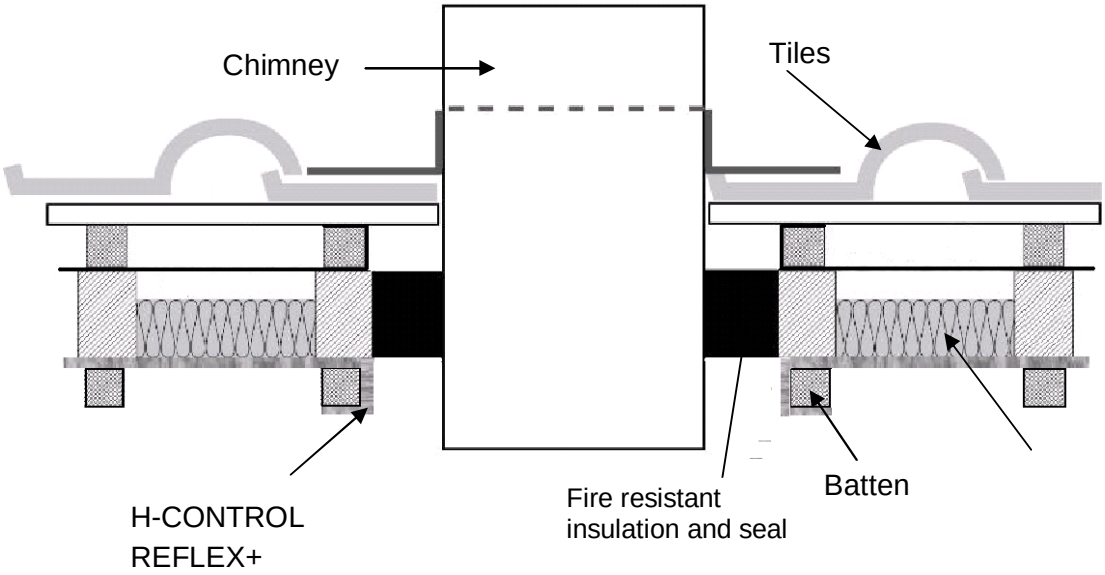

Figure 13: Installation detail near to the chimney