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MEMBER OF EOTA

EUROPEAN TECHNICAL APPROVAL ETA-13/0163

Trade names

PERINSUL® HL – thermal break for masonry walls

Holder of approval

**Pittsburgh Corning Europe NV/SA
Albertkade 1
B3980 TESSENDERLO
BELGIUM**

Generic type and use of construction product:

Thermal break made of cellular glass for masonry walls

Validity

**from :
to :**

**13 June 2013
13 June 2018**

Manufacturing plants:

PCE plants referenced Be-Tlo & Cz-Kla

This European Technical Approval contains:

16 pages including 3 annexes which form an integral part of this document



**Europese Organisatie voor Technische Goedkeuringen European
Organisation for Technical Approvals**

I. LEGAL BASES AND GENERAL CONDITIONS

1. This European Technical Approval is issued by SGS INTRON Certificatie B.V. in accordance with:
 - Council Directive 89/106/EEC¹ of 21 December 1988 on the approximation of laws, regulations and administrative provisions of Member States relating to construction products¹, modified by the Council Directive 93/68/EEC²; and Regulation (EC) no. 1882/2003 of the European Parliament and of the Council³;
 - Common Procedural Rules for Requesting, Preparing and Granting of European Technical Approvals set out in the Annex of Commission Decision 94/23/EC⁴;
2. SGS INTRON Certificatie B.V. is authorised to check whether the provisions of this European Technical Approval are met. Checking may take place in the manufacturing plants. Nevertheless, the responsibility for the conformity of the products to the European Technical Approval and for their fitness for intended use remains with the holder of the European Technical Approval.
3. This European Technical Approval is not to be transferred to other manufacturers or agents of manufacturers other than those indicated on page 1, or manufacturing plants other than those laid down in the context of this European Technical Approval.
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6. The European Technical Approval is issued by the approval body in its official language. This version corresponds fully to the version circulated within EOTA. Translations into other languages have to be designated as such.

¹ Official Journal of the European Communities n° L 40, 11.2.1989, p.12

² Official Journal of the European Communities n° L 220, 30.8.1993, p.1

³ Official Journal of the European Union n° L 284, 31-10-2003, p.25

⁴ Official Journal of the European Communities n° L 17, 20.1.1994, p.34

II SPECIFIC CONDITIONS OF THE EUROPEAN TECHNICAL APPROVAL

1 Definition of product and intended use

1.1 Definition of the construction product

Thermal break made of cellular glass, with a bitumen/PE-liner, for masonry walls, called *PERINSUL® HL*

1.2 Intended use

The thermal break made of cellular glass, called *PERINSUL® HL*, is designed to be incorporated in masonry walls. The masonry walls with the thermal break shall assure the stability in accordance with the EN 1996-01 and the energy performances to prevent heat losses and mould growth/surface condensation.

The use categories in accordance with EOTA TR 034 are IA3 and S/W 3: "products which are completely covered with tight products capable of avoiding any kind of migration of dangerous substances to indoor air, soil and water".

Both in regard to design and installation, the use of the thermal break units is subject to the standards and regulations in force at the place of use. For possible uses of *PERINSUL® HL*, see Annex 1.

1.3 Intended working life

The provisions, assessment methods and the verification included or referred to in this ETA have been written based upon the intended working life of the thermal break, called *PERINSUL® HL*, for the intended use of 50 years provided that the conditions laid down in sections 4 and 5 for packaging / transport / storage / installation / use / maintenance / repair are met. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a means for choosing the right products in relation to the expected economically reasonable working life of the works.

2 Characteristics of the product(s) and methods of verification

2.1 General

This ETA is issued for thermal break made of cellular glass, called *PERINSUL® HL*, on the basis of the information deposited at SGS INTRON Certificatie B.V.

2.2 Characteristics and methods of verification

2.2.1. Mechanical resistance and stability

In general:

Within this ETA, following the procedure described in the EN 1996-1-1, following masonry units and mortar types are taken into account:

Masonry units	f_b N/mm ² (MPa)	General Purpose Mortar	f_m N/mm ² (MPa)
Calcium Silicate units; Group 1 ¹⁾	12	M10	10
Clay units; Group 1 – solid clay bricks without any holes	15	M10	10
Clay units; Group 2 ¹⁾	17.5	M10	10

¹⁾ Hole patterns of the masonry units, used at the tests: see annex 3.

The information given below is only valid for brick types which are at least equivalent to the specified types. For the use, the design and the installation of the thermal break, the design values of the mechanical strength shall further consider local specifications in force at the place of use.

2.2.1.1 Compressive strength as part of masonry with PERINSUL® HL (*Regulatory characteristic 1 of the product*)

The characteristic compressive strength of masonry f_k with the thermal break included is given in the table below:

Values of f_k for PERINSUL®HL with compressive strength $f_{b,tb} = 2.9 \text{ N/mm}^2 \text{ (MPa)}$

Masonry units	f_b N/mm ² (MPa)	General Purpose Mortar	f_m N/mm ² (MPa)	f_k N/mm ² (MPa)
Calcium Silicate units; Group 1 ¹⁾	12	M10	10	1.8
Clay units; Group 1	15	M10	10	1.6
Clay units; Group 2 ¹⁾	17.5	M10	10	1.5

¹⁾ The values of the compressive strength of masonry f_k only apply for units at least equivalent to the tested units, see annex 3.

where:

- $f_{b,tb}$ is the normalized mean compressive strength of the thermal break units, in the direction of the applied action effect according to EN 771-1, in N/mm².
- f_b is the normalised mean compressive strength of masonry units, in the direction of the applied action effect according EN 772-1, in N/mm²
- f_m is the compressive strength of the mortar according EN 1015-11, in N/mm²
- f_k is the characteristic compressive strength of the masonry with the thermal break included according to EN 1052-1 in N/mm². The values are only valid for short term loading, as for the design value for the long-term compressive strength of PERINSUL® HL units see 2.2.4.4.

2.2.1.2 Shear strength as part of masonry

The declared values of the initial shear strength of masonry f_{vk0} with the thermal break included and the characteristic value of the coefficient of friction μ , are given in the table below. This value is only valid for short time loading.

Values of f_{vk0} and μ for PERINSUL®HL with compressive strength $f_{b,tb} = 2.9 \text{ N/mm}^2 \text{ (MPa)}$

Masonry units	f_b N/mm ² (MPa)	General Purpose Mortar	f_m N/mm ² (MPa)	f_{vk0} N/mm ² (MPa)	μ -
Calcium Silicate units; Group 1	12	M10	10	0.16	0.12
Clay units; Group 1	15	M10	10	0.13	0.35
Clay units; Group 2	17.5	M10	10	0.18	0.25

where:

- f_b is the normalized mean compressive strength of masonry units, in the direction of the applied action effect according to EN 771-1, in N/mm²
- f_m is the compressive strength of the mortar according to EN 1015-11 in N/mm²
- f_{vk0} is the characteristic initial shear strength of the masonry with the thermal break included according to EN 1052-3 in N/mm².
- μ is the characteristic value of the coefficient of friction according to EN 1052-3.
- $f_{b,tb}$ is the normalized mean compressive strength of the thermal break units, in the direction of the applied action effect according to EN 771-1, in N/mm².

2.2.1.3 Flexural strength as part of masonry

No performance determined.

2.2.2 Safety in case of fire (*Regulatory characteristic 2 of the product*)

2.2.2.1 Reaction to fire

The core material of PERINSUL® HL is cellular glass with class A1. Together with the liner PERINSUL® HL is classified with class E according to EN 13501-1.

2.2.2.2 Resistance to fire

The classification assigned to loadbearing walls composed of bricks and a thermal bridge, type PERINSUL® HL are in accordance with the procedures given in EN 13501-2. Exposure conditions during the fire resistance tests:

- Temperature/time curve: standard as in EN 1363-1;
- Direction of the exposure:
 - the wall assembly is asymmetric.
 - the thermal bridge is fire protected from the exposed side;
 - plaster is applied on the exposed side of the wall;
- One side exposed to the fire;
- Load applied on the PERINSUL® HL blocks: 0.55 N/mm²;
- Vertical edges free, horizontal edges fixed.

Perforated clay bricks

REI 120

REW 180

RE 180

This classification is valid for the following end use application according to EN 13501-2 and EN 1365-1:

1. Thermal bridge – brand and type: PERINSUL® HL – material: cellular glass – dimensions: 450 mm x 140 mm x 101 mm – density: 203 kg/m³ (MV)
 - number of rows: 1 (first layer);
 2. Perforated brick – declared strength: > 15 N/mm² – material: clay brick – apparent density: 813 kg/m³ (MV) – dimensions: 285 mm x 188 mm – thickness: 135 mm.
 - number of rows: 14;
 3. Mortar – class: M5 according to EN 1015-11;
 4. Gypsum at exposed side of the wall - density: 8.20 kg/m² (MV) – thickness: 10 mm
- Protection exposed side thermal bridge:
5. Floor insulation - material: cellular glass – density: 138 kg/m³ (MV)
 - dimensions: 300 mm x 1200 mm – thickness: 101 mm
 - number of layers: 1;
 6. Screed panel – material: cementitious based – dimensions: 247 mm x 2890 mm – thickness: 30 mm - density: 2337 kg/m³ (MV)
 - number of layers: 1;
 7. Strip of acoustic insulation – material: foam – length: 2890 mm – thickness: 3 mm - density: 30 kg/m³ (MV)
 - position: between the concrete floor and the wall.
 - number of layers: 1;
 8. Plastic – dimensions: 310 mm x 2890 mm – thickness: 0.11 mm (MV)
 - position: between the floor insulation and the concrete floor.

The classification is applicable to similar constructions where one or more of the changes listed below are made and the construction continues to comply with the appropriate design code for its stiffness and stability:

- a) The height of the wall may be decreased;
- b) The width of the wall may be increased;
- c) The thickness of the wall may be increased: the thickness shall be no less than 135 mm;

- d) The thickness of each of the component materials may be increased:
 - The thickness of the thermal bridge shall not be less than 140 mm;
 - The thickness of the plasterwork shall not be less than 10 mm;
 - The thickness of the floor insulation shall not be less than 101 mm;
 - The thickness of the concrete floor shall not be less than 30 mm.
 - e) The linear dimensions of the bricks/blocks may be decreased, except for the thickness:
 - The dimensions of the bricks shall not exceed 285 x 188 mm;
 - The dimensions of the thermal bridge shall not exceed 450 mm x 140 mm;
 - f) The number of joints may be increased;
 - g) It is allowed to have horizontal and vertical joints of the same type;
 - h) Decrease of the applied load is allowed
 - The load on the thermal bridge shall not exceed 0.55 N/mm².
- Other changes are not permitted.

Calcium silicate bricks

REI 240

REW 240

RE 240

This classification is valid for the following end use application according to EN 13501-2 and EN 1365-1:

1. Thermal bridge – brand and type: PERINSUL® HL – material: cellular glass – dimensions: 450 mm x 140 mm x 101 mm – density: 203 kg/m³ (MV)
 - number of rows: 1 (first layer);
2. Solid brick – compressive strength: 12 N/mm² (CS12) – material: Calcium Silicate – apparent density: 1759 kg/m³ (MV) – dimensions: 329 mm x 156 mm – thickness: 150 mm.
 - number of rows: 17;
3. Mortar – class: M5 according to EN 1015-11;
4. Gypsum at exposed side of the wall - density: 8.20 kg/m² (MV) – average thickness: 12.5 mm
Protection exposed side thermal bridge:
5. Floor insulation - material: cellular glass – density: 138 kg/m³ (MV)
dimensions: 300 mm x 1200 mm – thickness: 101 mm
 - number of layers: 1;
6. Screed panel – material: cementitious based – dimensions: 247 mm x 2890 mm – thickness: 30 mm - density: 2337 kg/m³ (MV)
 - number of layers: 1;
7. Strip of acoustic insulation – material: foam – length: 2890 mm – thickness: 3 mm - density: 30 kg/m³ (MV)
 - position: between the concrete floor and the wall.
 - number of layers: 1;
8. Plastic – dimensions: 310 mm x 2890 mm – thickness: 0.11 mm (MV)
 - position: between the floor insulation and the concrete floor.

The classification is applicable to similar constructions where one or more of the changes listed below are made and the construction continues to comply with the appropriate design code for its stiffness and stability:

- a) The height of the wall may be decreased;
- b) The width of the wall may be increased;
- c) The thickness of the wall may be increased: the thickness shall be no less than 150 mm;
- d) The thickness of each of the component materials may be increased:
 - The thickness of the thermal bridge shall not be less than 140 mm;
 - The thickness of the plasterwork shall not be less than 12.5 mm;
 - The thickness of the floor insulation shall not be less than 101 mm;
 - The thickness of the concrete floor shall not be less than 30 mm.
- e) The linear dimensions of the bricks/blocks may be decreased, except for the thickness:
 - The dimensions of the bricks shall not exceed 329 x 156 mm;
 - The dimensions of the thermal bridge shall not exceed 450 mm x 140 mm;
- f) The number of joints may be increased;
- g) It is allowed to have horizontal and vertical joints of the same type;
- h) Decrease of the applied load is allowed
 - The load on the thermal bridge shall not exceed 0.55 N/mm².

Other changes are not permitted.

For other applications: NPD

2.2.3 Hygiene, health and environment (*Regulatory characteristic 3 of the product*).

2.2.3.1 Content and/or release of dangerous substances

The chemical constitution and composition of the "thermal break made of cellular glass for masonry walls" and/or constituents of the product is deposited at the Approval Body which will maintain strict rules of confidentiality.

Further a written declaration is deposited at the Approval Body stating whether or not and in which concentration "thermal break made of cellular glass for masonry walls" and/or constituents of the product contains substances which have to be classified as dangerous according to Directive 67/548/EEC and Regulation (EC) No 1272/2008 and listed in the "Indicative list on dangerous substances" of the EGDS - taking into account the installation conditions of the construction product and the release scenarios resulting from there.

The use of highly selected recycled materials is $\geq 60\%$.

2.2.3.2 Dimensional stability specified at temperature and humidity

The relative changes in length, $\Delta\epsilon_l$, width, $\Delta\epsilon_b$, after storage for 48 h at $(70 \pm 2)^\circ\text{C}$ and $(90 \pm 5)\%$ relative humidity in accordance with EN 1604, do not exceed 0.5 %. The relative change in thickness, $\Delta\epsilon_d$, does not exceed 1.0 %.

2.2.3.3 Water absorption by immersion – long term

Long term water absorption by partial immersion, W_{ip} , in accordance with EN 12087-method B does not exceed 0.5 kg/m².

2.2.3.4 Water vapour resistance

For the vapour diffusion resistance, μ , the value quoted in EN ISO 10456 is used: μ , \approx infinite (∞).

2.2.4 Safety in use (Regulatory characteristic 4 of the product).

2.2.4.1 Compressive strength of the PERINSUL HL unit

The mean value of the compressive strength (f_b) of PERINSUL® HL according to EN 772-1 (measured both on 100 mm x 100 mm x 100 mm and 100 mm x 100 mm x 65 mm test specimens is: $f_b \geq 2.9 \text{ N/mm}^2$.

The variation within the test results does not deviate more than 25%.

With regard to the compressive strength PERINSUL® HL is in accordance with masonry units of category II according to section 2.4.3 of EN 1996-1-1:2005+AC:2009.

2.2.4.2 Creep - long term behaviour

In accordance with EN 1606, at the declared stress of 800 kPa, the declared level i_2 of compressive creep corresponding to fifty years is 1.5 mm and the declared level of total thickness reduction i_1 is 1.5 mm. This is valid for a maximum thickness of PERINSUL® HL of 65 mm.

2.2.4.3 Eccentric loading behaviour

The eccentric loading behaviour is equivalent to materials (like aerated concrete) of which the loading behaviour has been published in EN 1996-1-1.

2.2.4.4. Long term compressive strength :

The declared mean value of the long term compressive strength in accordance with EN 772-1 of the PERINSUL® HL units is 0.8 N/mm^2 . For the design values of the mechanical strength further local specifications in force at the place of use shall be respected.

2.2.5 Protection against noise (Regulatory characteristic 5 of the product).

Not relevant.

2.2.6 Energy economy and heat retention (Regulatory characteristic 6 of the product).

2.2.6.1 Thermal resistance

The thermal conductivity of PERINSUL® HL in accordance with EN 12667 and determined according to EN 1745 is $\lambda_D \leq 0.058 \text{ W/mK}$.

Examples of the thermal resistance of PERINSUL® HL are given in Annex 2..

2.2.6.2 Thermal linear transmittance

A number of default values of thermal linear transmittance, determined according to EN ISO 10211/ EN ISO 14683, are given in Annex 2.

2.2.7 Durability & general aspects relating to fitness for use

2.2.7.1 Fire protective

The thermal break shall be installed in such a way that it is always covered by renders (wall) or screed (flooring). So in principal, the PERINSUL-thermal break as part of the masonry and following its installation rules is never directly exposed to fire conditions. If what so ever stability & fire resistance is required, for its fire resistance (REI) see § 2.2.2.2 or an extra fire protective product shall be positioned in front of the thermal break.

2.2.7.2 Resistance to moulds

PERINSUL® HL is resistant to moulds

2.2.7.3 Anti biological attack

PERINSUL® HL is resistance against biological attack.

2.2.7.4 Chemical resistance

PERINSUL® HL is resistance against common household chemicals, except sodium and potassium hydroxide (drain cleaner). In special cases the holder of the approval shall be consulted.

2.2.7.5 Geometry

For geometry (length, width, thickness, squareness, flatness) the declared values and tolerances are given in table 2:

Characteristic	Test method	Declared value	Tolerance
Thickness	EN 823	50 mm - 115 mm (5 mm steps)	± 2mm
Length	EN 822	450 mm	± 2mm
Width	EN 822	100 mm - 365 mm (5 mm steps)	± 2mm
Squareness	EN 824	$S_{l,b} \leq 5 \text{ mm/m}$ $S_d \leq 2 \text{ mm}$	-
Flatness	EN 825	$S_{max} \leq 2 \text{ mm}$	-

2.2.7.6 Density

Density of the units, determined according to EN 1602 is 200 kg/m³ (±15%)

2.2.7.7 Thickness of bitumen layer

The thickness of the bitumen layer is ≤ 0.5 mm.

Method of verification:

Thickness to be determined by use of digital callipers (accuracy of 0,01 mm) in combination with a microscope. Thickness measurement to be performed on the upper- and lower side of the unit in the area of the edges (distance to edge 0.5 cm) as well as in the middle of the unit, on three different places.

3 Evaluation of Conformity and CE marking

3.1 Attestation of the System of conformity

The European Commission, according to the decision on the Procedures of Attestation of Conformity 2003/656/EC of 12 September 2003 (Official Journal of the European Union No L 231 of 17 September 2003), has laid down for this type of material a System 2+ for the procedure of attestation of conformity (AoC).

The AoC system 2+ provides:

a) *Tasks for the manufacturer*

- Initial type-testing of the products being part of ETA,
- Factory production control;
- testing of samples taken at the factory in accordance with a prescribed test plan.

b) *Tasks of the approved bodies*

Inspection Body:

- Initial inspection of the factory production control.
- Continuous surveillance, assessment and approval of factory production control.

Certification Body:

- Granting of a certificate of conformity.

3.2 Responsibilities

3.2.1 Tasks of the manufacturer

3.2.1.1 Factory production control

The manufacturer shall exercise permanent internal control of production. All the elements, requirements and provisions adopted by the manufacturer shall be documented in a systematic manner in the form of written policies and procedures, including records of the results performed. This production control system shall insure that the product is in conformity with this European Technical Approval.

The manufacturer may only use initial / raw / constituent materials stated in the technical documentation of this European Technical Approval.

The factory production control shall be in accordance with the “Control plan” relating to the European Technical Approval ETA-13/0163 issued on 13th of May 2013 which is part of the technical documentation of this European Technical Approval. The control plan is laid down in the context of the factory production control system operated by the manufacturer and deposited with SGS INTRON Certificatie B.V.

The results of the factory production control shall be recorded and evaluated in accordance with the provisions of the control plan.

3.2.2 Tasks of the Approved Body

3.2.2.1 Initial inspection of factory and factory production control.

The approved Inspection Body ascertains that factory conditions and production control allow the manufacturer to ensure the consistency and homogeneity of the manufactured product and its traceability. In this way it is guaranteed that the final characteristics of the PERINSUL® HL are those indicated in chapter 2 of this ETA.

3.2.2.2 Continuous surveillance, assessment and approval of Factory Production Control

The approved Inspection Body shall visit the producer at least once a year. Surveillance of the manufacturing process shall include a continuously assessment of the effectiveness of the factory production control in accordance with the requirements of the test plan:

- Checking the documentation of factory production control, to ensure continuing compliance with the provisions of the ETA,
- Identification of changes by comparing data obtained during the initial inspection or during the last inspection;

In cases where the ETA provisions and the control plan are no longer fulfilled, the certificate of conformity shall be withdrawn.

3.2.3 **Approved Certification Body**

The certification of the factory production control by an approved Certification Body is based on the results of:

- Initial inspection of the factory production control.
- Continuous surveillance, assessment and approval of factory production control.

The approved certification body involved by the manufacturer shall issue an EC certificate of conformity of the factory production control stating the conformity with the provisions of this European technical Approval.

3.3 **CE Marking**

CE marking⁵ shall be affixed on the packaging of the PERINSUL® HL. The letters“CE” shall be followed by the identification number of the approved certification body, where relevant, and be accompanied by the following additional information:

- Name and address of the producer (legal entity responsible for the manufacturer)
- The last two digits of the year in which the CE marking was affixed,
- Number of the EC certificate for the factory production control (system 2+),
- Number of European Technical Approval (ETA),
- Characteristics, performances, etc. of the product:

- | |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none">- Fire reaction class (EN 13501-1)- Thermal conductivity/resistance (λ_D W/mK & R_D m²K/W)- Compressive strength of the block (EN772-1) – mean value $f_b \geq \dots$ N/mm²- Creep-long term (EN1606) $CC \geq \dots$ N/mm² |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Both in regard to design and installation, the use of the thermal break units is subject to the standards and regulations in force at the place of use

4 **Assumptions under which the fitness for the product for the intended use was favourably assessed**

4.1 **Manufacturing**

The European Technical Approval is issued for the product on the basis of agreed data / information, deposited with SGS INTRON Certificatie B.V., which identifies the product that has been assessed and judged. Changes to the product or production process, which could result in this deposited data / information being incorrect, should be notified to SGS INTRON Certificatie B.V. before changes are introduced. SGS INTRON Certificatie B.V. will decide whether or not such changes affect the approval and consequently the validity of the CE marking on the basis of the approval and if so whether further assessment or alterations to the approval, shall be necessary.

4.2 **Packaging, transport, storage of the product**

The PERINSUL®-thermal break blocks are packed in boxes, transported and stored on pallets so that no damages shall occur..

⁵ Remarks:

- Notes on the CE marking are stated in Guidance Paper D of the European Commission "CE marking under the Construction Products Directive", Brussels May 2004.

4.3 **Installation of the product in the works**

The positioning of the PERINSUL® thermal break shall respect the installation requirements of the manufacturer and be in conformity with the state of the art of building masonry walls. Also all masonry dilatation joints and other constructive joints shall be respected. In the design and the calculation of the ultimate stresses, the Eurocode 6 (EN 1996-1-1) in local design requirements shall be respected.

The PERINSUL® blocks are horizontally positioned one against the other in the mortar and slightly and gently knocked with a trowel until the mortar on all slides is flowing out and a perfect adhesion is reached.

Knocking or banging with the sharp edges of the trowel or other objects shall be avoided. The vertical joints in between the PERINSUL® are closely positioned without mortar in between. As with all masonry, direct exposure to frost should be avoided.

For the position at the bottom of the masonry wall:

Upon the positioned PERINSUL® blocks the first layer of bricks are fully placed into the mortar and shall be installed in such a way that the loads are reparted over the surface. spread over

For the position under windows and sills:

So as to prevent punctual loads, in between the PERINSUL® blocks and the window a reparation (eg fibre cement board) is to foreseen. Sills on the insulation blocks are placed in a full mortar bed.

4.4 **Use, maintenance, repair**

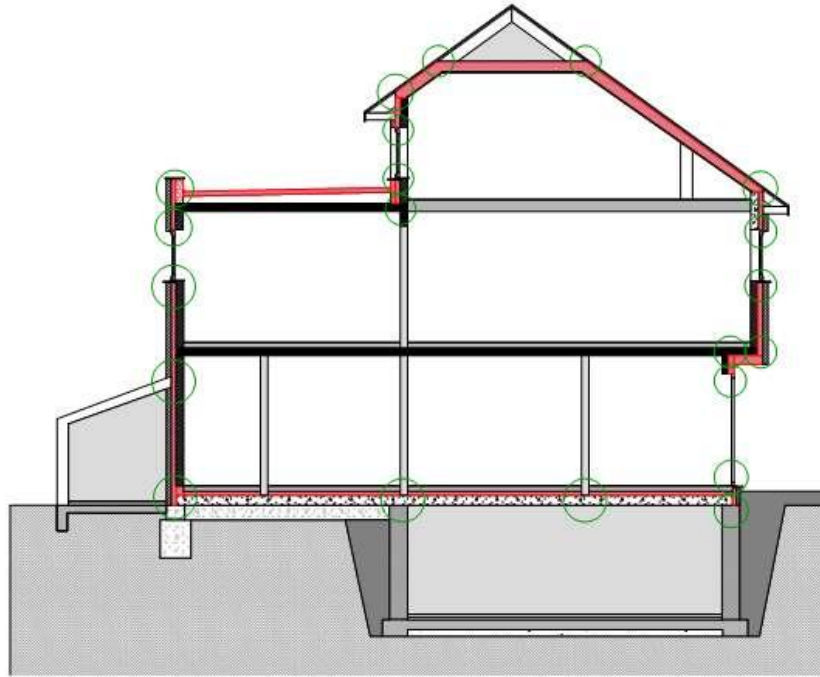
As the PERINSUL®-thermal break layer is integrated into the masonry, no extra attention as for maintenance or repair is necessary. Within the disposal and discharge treatment to thermal breaks can be considered on basis of the same waste/reuse procedures as for the masonry elements.

Singed on behalf and for SGS INTRON Certificatie B.V.

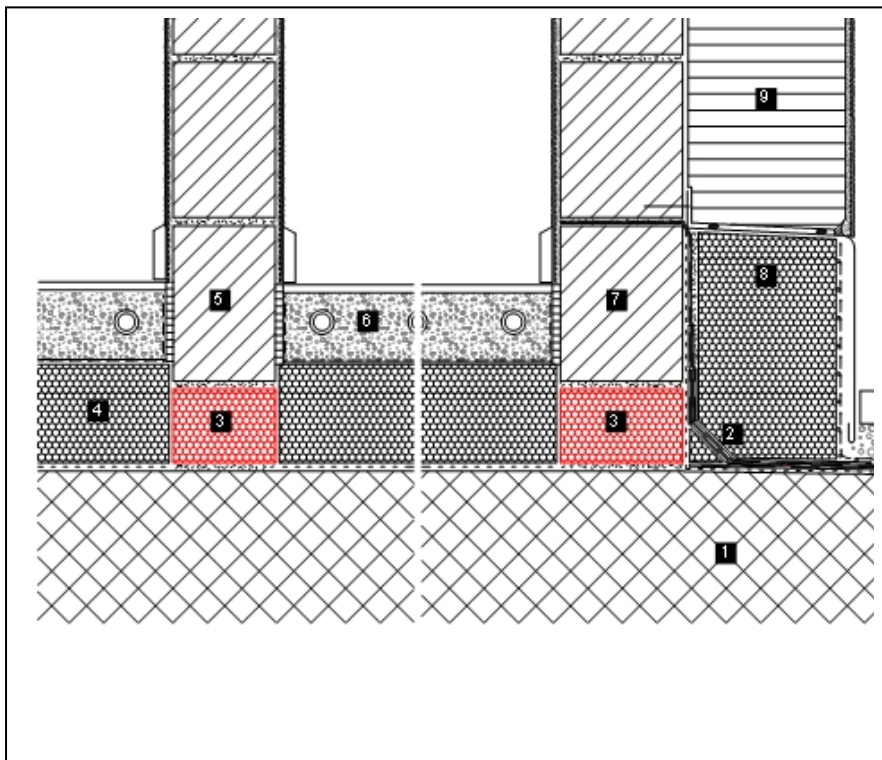


Ir. J.W.P. de Bont
Certification Manager

Possible applications PERINSUL® HL



Example detail



Legend

1. Concrete Floor
2. Watertightness slab
3. "PERINSUL"-thermal break
4. Thermal floor insulation (eg FOAMGLAS® slabs/boards)
5. Masonry
6. Screed
7. Masonry
8. Façade-insulated plinth or Perimeter-insulation
9. Thermal insulated cavity, ETICS, vêtures or ventilated façade finishing

Thermal resistance

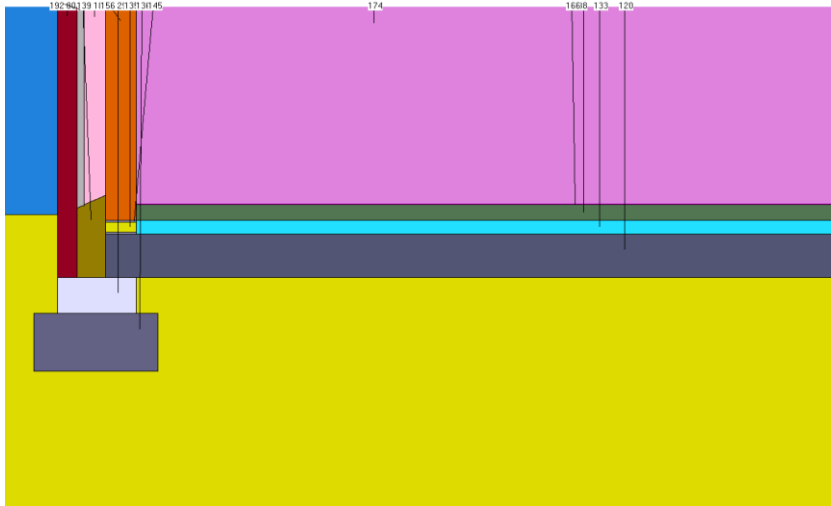
PERINSUL HL – standard length 450mm

$$\lambda_D = 0,058 \text{ W/mK}$$

Thickness (mm)	Width (mm)	R _{Dvert} (mK)/W	R _{Dhor} (mK)/W
50	90	0,85	1,55
50	110	0,85	1,90
50	115	0,85	1,95
50	140	0,85	2,40
50	175	0,85	3,00
50	190	0,85	3,25
50	240	0,85	4,10
50	300	0,85	5,15
65	100	1,10	1,70
65	140	1,10	2,40
65	215	1,10	3,70
100	100	1,70	1,70
100	140	1,70	2,40
100	190	1,70	3,25
100	215	1,70	3,70
115	115	1,95	1,95
115	175	1,95	3,00
115	240	1,95	4,10

Thermal linear transmittance

Example: application in foundations

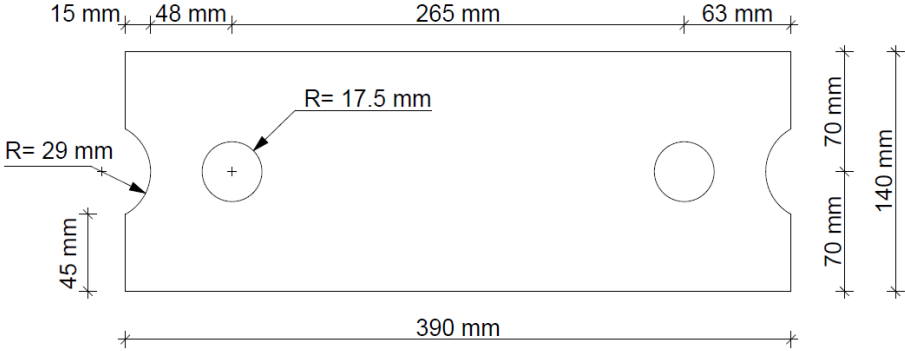


Wall U max	Roof U max	Floor U max	Floor
			R min
0.4	0.3	0.4	1
0.4	0.3	0.4	1
0.32	0.27	0.35	1.3
0.32	0.27	0.35	1.3
0.24	0.24	0.3	1.75
0.24	0.24	0.3	1.75

Perinsul HL Thickness in cm	U-wall W/m ² K	R-floor m ² K/W	PSI (Ψ _e) W/mK	f-factor	min temp °C
5	0.361	1.28	-0.059	0.88	17.6
5	0.361	2.725	-0.0514	0.892	17.84
5	0.287	1.53	-0.0264	0.887	17.74
5	0.287	3.07	-0.023	0.897	17.94
5	0.22	2.018	-0.007	0.898	17.96
5	0.22	3.76	-0.0056	0.907	18.14
Outside temperature 0°C			Inside temperature 20°C		

Hole pattern units, used at determination compression strength (see 2.2.1.1)

Calcium silicate units; group 1



Clay units; group 2

