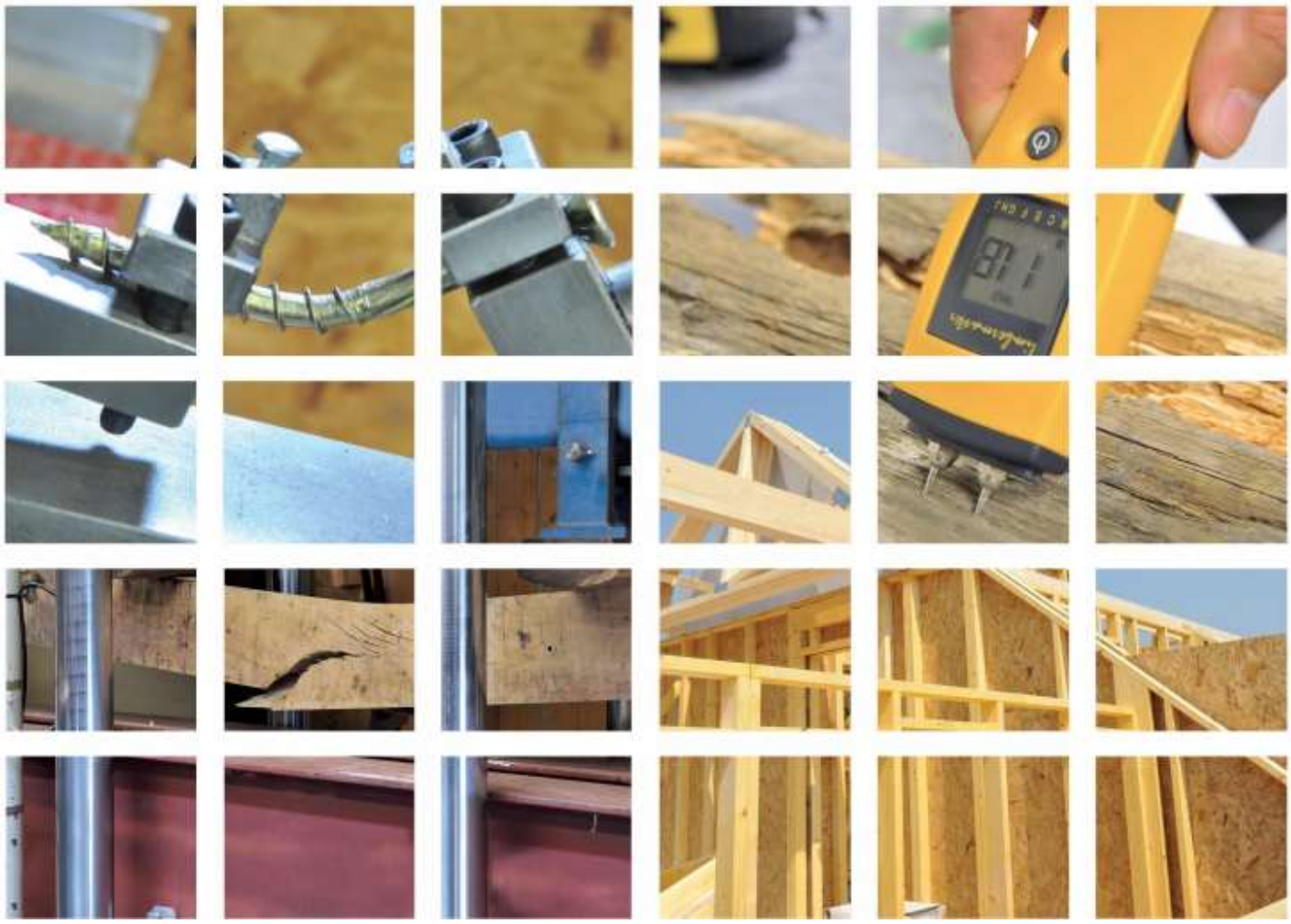
# Q-Mark Registration Schedule

## Vapour Permeable Roof/Wall Membrane

### Boost$^{R}$ Hybrid and Boost$^{R}$ Hybrid Roof

ACTIS SA
30 Avenue de Catalogne
11300 Limoux
France



# Q-Mark Registration Schedule

| | | |
|---|---|---|
| **Holder of Q-Mark** | | ACTIS SA |
| **Product Name** | | Boost$^{R}$ Hybrid |
| **Type and Use of Product** | | Vapour Permeable Membrane for use in Roofs, Walls and Floors |
| **Validity:** | **From** | 01/07/2022 |
| | **To** | 03/03/2025 |
| **Date of This Issue** | | 01/07/2022 |
| **Issue Number** | | 5 |
| **This Issue Replaces** | | Revision 4, 04/03/2022 |
| **Relates to Certificate Number** | | CPS-014 |
| **Manufacturing Address/s** | | 30 Avenue de Catalogne<br>11300 Limoux<br>France |
| **This Schedule Contains** | | 65 Pages, including 3 Annexes |

Contents Page

# 1 INTRODUCTION

The Q-Mark Scheme is a third-party Product Certification Scheme operated by BM TRADA.

The Scheme is based on the principles of ISO 9001, EN 45011, ISO 17021, and ISO Guide 62/65 and confirms compliance with EN 13859-1/2: 2010, together with a specific set of performance criteria set by BM TRADA (as defined in Clause 4 of this document) in order to attain a product which performs to a high standard. The relevant standards listed above are to be read in conjunction with this document.

The Scheme covers Factory Production Control (FPC), documentation and test/assessment evidence, and the resultant certification is specific to clearly defined products and their constituent components.

The objectives of the Scheme are:

- To improve the quality and performance of Building Products.
- To provide unambiguous evidence of compliance with the standards or methods listed.
- To provide specifiers, regulators and inspection authorities with the appropriate information for them to identify suitable products.

# 2 DEFINITIONS & ABBREVIATIONS

The following definitions and abbreviations are used throughout the document. Other definitions are as given in the relevant standards.

| | |
|---|---|
| Assessment | A considered judgement to consider whether products meet the criteria laid down in the relevant Technical Specification |
| Audit | Visit by BM TRADA or other certification body to examine the quality management system and production processes of a manufacturer or supplier, usually to determine appropriate compliance to ISO 9001, with specific emphasis on the factory production control elements |
| Member | Company holding membership of the Q-Mark scheme |
| QMS | Quality Management System (e.g. one meeting BS EN ISO 9001) |
| Schedule | The certification schedule, which identifies the scope and range of products covered by the membership certificate |
| Scheme | The BM TRADA Q-Mark Construction Products Scheme |

# 3 SCOPE

The Scheme is applicable to construction products that fall within the scopes of the product standards referenced in Clause 1 of this document, and applies to products as manufactured and supplied, and before being installed into the works.

# 4 PRODUCT DESCRIPTION

## 4.1 General

Boost$^{R}$ Hybrid is a vapour permeable Roof (warm pitched roofs only), Wall and Floor underlay manufactured in accordance with BS EN 13859-1/2. It also provides complementary insulating properties due to its thermal resistance and reflective properties. However, these properties are outside of the scope of BS EN 13859-1/2. The thermal performance is however covered by a complementary certificate issued by Eurofins Expert Services Ltd.

The product consists of a total of nine layers consisting of one watertight breathable coated metal membrane (outer side), four polyester fibre wadding layers, three perforated coated metal polyolefin films and a perforated coated metal reinforced polyolefin film (inner side). The internal layers are fastened together by ultrasonic welding, gluing or stitching.

Boost$^{R}$ Hybrid is available with or without a built in self-adhesive flap, which facilitates sealing of joints between adjacent sheets, see drawing below.

The product is CE marked by the manufacturer on the basis of certificate number C-9328-13 issued by Eurofins Expert Services Ltd.

The product may also be available with alternative CE marked membranes, e.g. Boost$^{R}$ Hybrid Roof has an opaque membrane. In these cases the Declaration of Performance should be consulted to ensure that the appropriate emissivity values are used.

### 4.2 Table 1: Nominal Characteristics

| Property | Boost$^{R}$ Hybrid |
|---|---|
| Thickness (mm) | 35 |
| Weight/unit area (g/m$^2$) | 650 |
| Roll length (m) | 6.7 |
| Roll width (mm) | 1500 |

### 4.3 Intended Use

Under the scope of this certification, Boost$^{R}$ Hybrid has been approved for use as:

- Roof Underlay in Pitched Roofs
- Breather Membrane in Wall Constructions
- Breather Membrane in Timber Floor Constructions

When used in roofs, the space between the underlay and roofing surface material, e.g. tiles, must be ventilated. The underlay can also be installed directly on the thermal insulation or with an unventilated air gap between it and the thermal insulation.

Boost$^{R}$ Hybrid may also be used under tiles supported on OSB sarking boards, provided that a specific condensation risk calculation is carried out to confirm that there is no significant risk of condensation forming within the roof structure. Example calculations for this type of installation are included in Annex 3, but as BS 5250 suggests that ventilation would normally be required below the OSB in this case, it is important to conduct calculations for each specific design in order to demonstrate that condensation will not occur when this ventilation is not provided.

The product can be used as a breathable membrane in walls. It can be installed in direct contact with the thermal insulation of the wall or with a unventilated air gap between it and the thermal insulation or sheathing. The space between the product and the outer cladding must be drained and ventilated.

When used in Wall or Roof or Floor construction, a condensation risk assessment must be carried out in accordance with BS 5250.

## 5 BUILDING CONTROL AND OTHER THIRD PARTIES

This Certification Schedule is provided to the Client for their own purposes and BM TRADA cannot opine on whether it will be accepted by Building Control Authorities or any other Third Parties for any purposes.

## 6 SCHEME REQUIREMENTS

BM TRADA has determined that the Member conforms with the requirements within these Clauses by auditing and/or other forms of verification where appropriate.

### 6.1 Quality Management (QMS)

The manufacture of the products has been conducted under the control of an appropriate Quality Management System.

The Quality Management System is subject to periodic audit (not less than once per year).

All new Members are subject to an initial inspection.

### 6.2 Documentation

The following documents are controlled under the requirements of this Scheme:

- Manufacturing documentation (e.g. Quality Manual, procedures)
- Product specification/range documentation and Assessment
- Installation instructions
- Test Reports and Sampling
- Q-Mark Certificate and Schedule(s)

#### 6.2.1 Manufacturing Documentation

The Member has supplied details of his manufacturing documentation to BM TRADA for review. This comprised of the Quality Manual, Procedures, works instructions and test data.

## 7 MINIMUM QMS REQUIREMENTS

### 7.1 Quality Management System

As part of the documented process control procedures the company has:

- Demonstrated that the products are being fabricated in accordance with documented manufacturing procedures, from purchase of raw material to the production of the finished product.
- These procedures control all critical aspects of the production.
- Target limits are defined at each one of these areas.
- All performance characteristics claimed are controlled in order to remain consistent by including appropriate checks or testing in the QMS to ensure a consistent and similar product is produced.

### 7.2 Management Responsibility

The management of the company carries out regular reviews of the system, which shall include production records and any complaints that have been received. Notes are kept of any topics discussed and decisions made.

### 7.3 Company Representative

A member of the management team is responsible for the FPC System.

### 7.4 Internal Audits

Routine internal audits are carried out to ensure compliance with the requirements of the scheme is met.

### 7.5 Documentation

Inspection and test records are kept in a format that is acceptable to BM TRADA Certification for a minimum of 5 years.

### 7.6 Work Instructions

Work instructions and target values are placed at the critical production points throughout the manufacturing process.

### 7.7 Procedures for Non-conforming Product

Where factory production control/target values are out of specification there is a procedure for identifying and correcting these deficiencies. The factory production control system has been assessed and found to be able to detect non-conforming product quickly enough so that affected product can be quarantined.

### 7.8 Traceability

There are procedures, which enable appropriate traceability of production runs through to dispatch.

### 7.9 Training

The company maintains records to show that staff have been satisfactorily trained to undertake the manufacturing and inspection tasks that they have been assigned. Records are kept of this training and the personnel's job description shall be clearly defined.

### 7.10 Complaints

The company maintains a register of all complaints received on the quality of their product, which shows the steps they have taken to deal with the problem and their analysis of the causes. These records are kept for a minimum of 5 years.

### 7.11 Document Control

There are procedures in place for effectively controlling the quality of documentation issued to the relevant personnel, so that they have up-to-date procedures.

### 7.12 Machinery Maintenance and Calibration

All machinery and measuring / testing equipment that could affect the quality of the product is properly maintained and calibrated so that a consistent product can be produced and tested. There is a maintenance and calibration schedule. A record is kept of the maintenance and calibration carried out.

## 8 OTHER REQUIREMENTS OF THE SCHEME

### 8.1 Product Specification/Range Documentation and Assessment

The member has supplied BM TRADA with product details for review. These included material specifications, dimensions, tolerances and components. This product specification forms part of the manufacturing procedure.

Should the product specification of the certified product/s change, the member shall inform BM TRADA of the changes. A decision on the way forward shall be made to ensure continuation of certification.

## 9 TRANSPORT STORAGE AND INSTALLATION INSTRUCTIONS

### 9.1 General

The member shall ensure that adequate installation, storage and transport instructions are supplied with each pack or consignment of product. Any alterations to the instructions shall only be made following consultation with BM TRADA.

### 9.2 Transport and Storage

The products shall be supplied in rolls wrapped in polyethylene on pallets. Each roll bears a label indicating the manufacturers name, the product name, nominal dimensions and the BM TRADA Q-Mark logo and Certificate Number.

### 9.3 Installation

- Boost$^{R}$ Hybrid shall be installed horizontally or vertically in accordance with the manufacturers' installation instructions. Installation can be performed in ordinary temperature conditions for building works. See Annex for Roof, Wall and Floor drawings and other information.
- The maximum span between supports onto which the product is attached shall be 600 mm, and each row/joint shall be overlapped by at least 100 mm for roofs with slope greater than $18^0$ or at least 200 mm for roofs with slope equal to or below $18^0$.
- The underlay shall be installed by use of corrosion resistant staples or nails, with the perforated side facing inwards and the watertight breather membrane facing outwards. For use in roofs the staples should have a minimum length of 14 mm. For wall applications the length of staples should be chosen in relation to the support thickness. The maximum distance between staples along end to end joints shall be 100 mm. Following stapling, the overlaps shall be covered using a proprietary ACTIS reflective adhesive tape.
- All joints, including those around windows and ventilation pipes must be sealed with an appropriate reflective adhesive tape. The product shall not come into contact with a chimney. A suitable fire resistant material must be used around a chimney and any other hot surfaces that might present a fire risk.
- Use of supports or noggins is advised between rafters when the product is laid horizontally. The product shall be stapled to these supports at spacing's of no greater than 50mm.
- Following stapling the overlaps shall be covered with the adhesive tape appropriate to the external membrane type, or by using the built in sealing flap, if that version of the product is used. Staples shall also be covered with the adhesive tape appropriate to the external membrane type to ensure an air tight seal (Refer to Figure 2).

***Figure 1: Horizontal Installation***

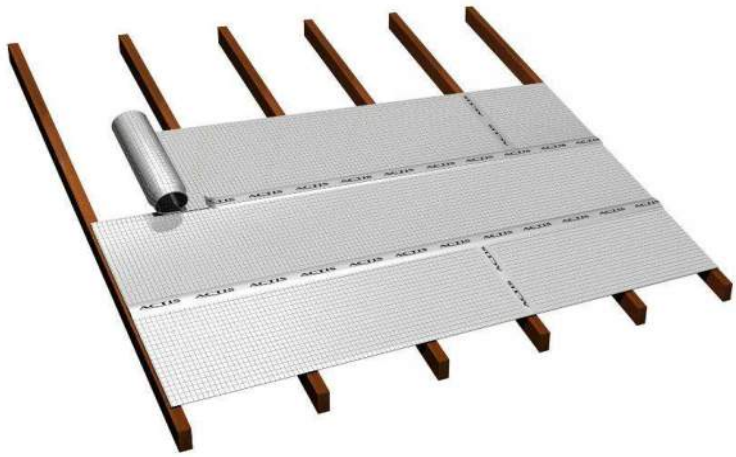
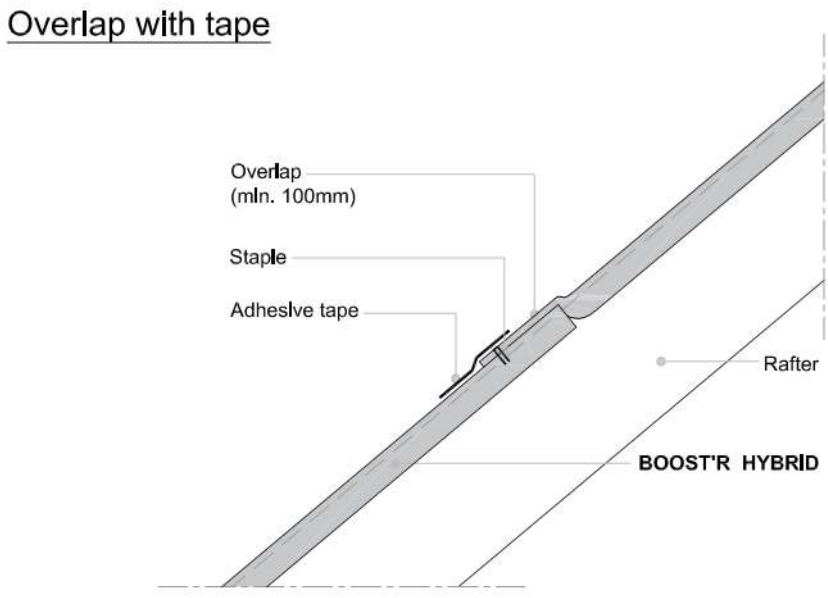
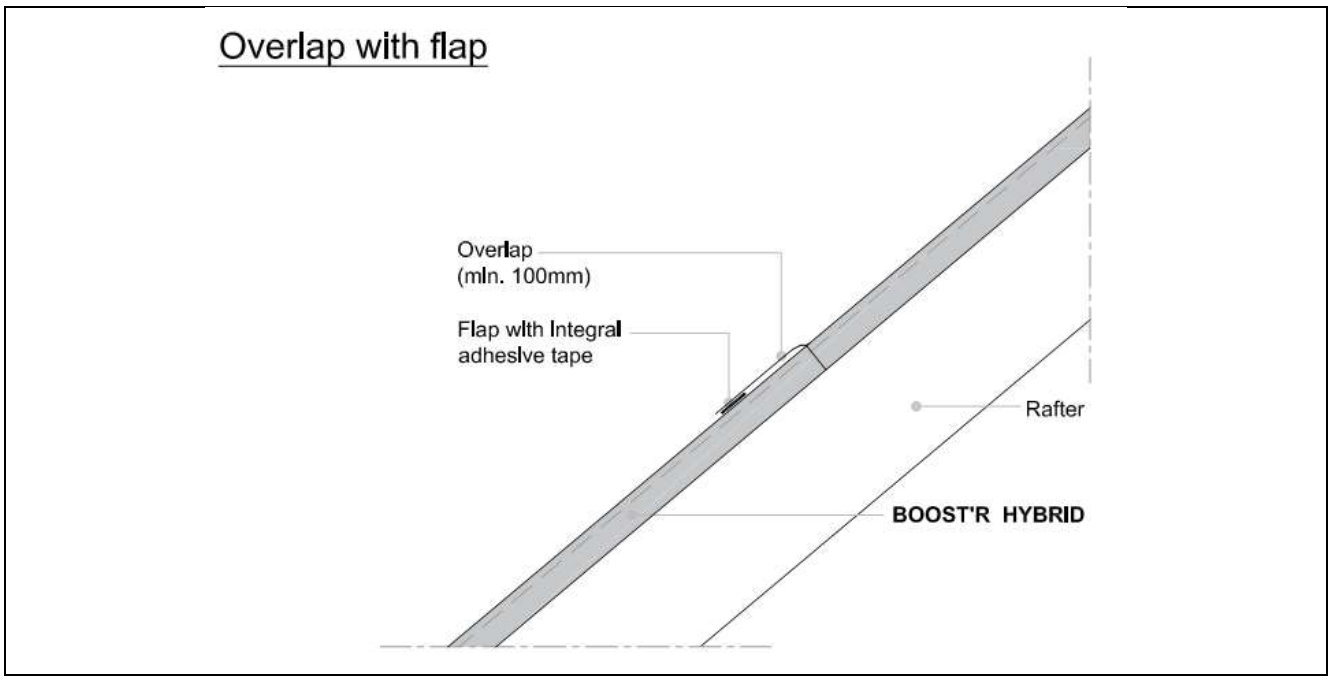


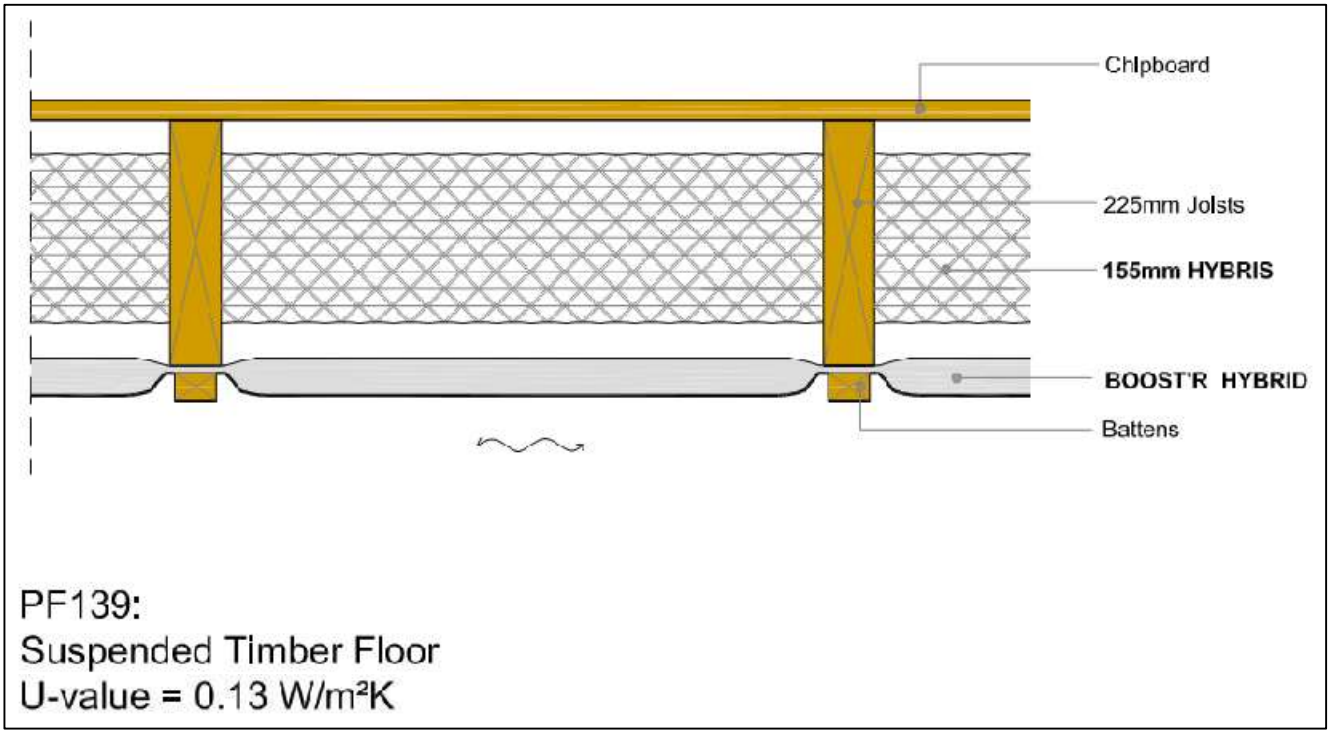
***Figure 2: Vertical Installation***

***Figure 3: Overlaps***






### 9.4 Floor Construction




## 10 TEST AND VERIFICATION REQUIREMENTS

### 10.1 Test Reports and Sampling

BM TRADA has assessed the results of testing and sampling, and/or calculation that has been carried out to demonstrate compliance with BS EN 13859-1/2, in accordance with the scheme rules. Many of the values quoted are derived from the existing certificate number C-9328-13 issued for this product by Eurofins Expert Services Ltd.

## 10.2 Initial Type Testing

### 10.2.1 Mechanical Resistance and Stability

Testing of the product has been carried out to determine the following properties and performance characteristics:

- Tensile Strength before and after ageing
- Resistance to nail tearing (nail shank)
- Water Tightness before and after aging
- Water Vapour Transmission
- Dimensional stability
- Air permeability

The test results are summarised in the Tables below.

#### 10.2.1.1 Table 2: Tensile Strength (N/50mm) to BS EN 12311-1 & EN 13859-1/2 Annex A

| | Boost$^{R}$ Hybrid | |
|---|---|---|
| **Direction** | **Before Ageing** | **After Ageing** |
| **Machine** | 429 | 545 |
| **Cross** | 217 | 250 |

#### 10.2.1.2 Table 3: Resistance to Nail Tearing (N) to BS EN 12310-1 & EN 13859-1/2 Annex B

| **Direction** | Boost$^{R}$ Hybrid |
|---|---|
| **Machine** | 235 |
| **Cross** | 240 |

#### 10.2.1.3 Table 4: Water Tightness to BS EN 1928, Method A

| | Boost$^{R}$ Hybrid | |
|---|---|---|
| | **Before Ageing** | **After Ageing** |
| **Class** | W1 | W1 |

#### 10.2.1.4 Table 5: Water Vapour Transmission (Sd & MNs/g) (BS EN ISO 12572, Method C)

| **Direction** | Boost$^{R}$ Hybrid |
|---|---|
| **Sd (m)** | 0.11 |
| **MNs/g** | 0.55 |
| | **Breather Membrane Component** |
| **MNs/g** | 0.25 |

#### 10.2.1.5 Table 6: Dimensional Stability (BS EN 1107, +80$^0$C/6h)

| | Boost$^R$ Hybrid |
|---|---|
| % Change | <1 |

### 10.2.2 Safety in Case of Fire

#### 10.2.2.1 Reaction to Fire

With regards to Reaction to Fire, the manufacturer has declared No Performance Assessed (NPA).

#### 10.2.2.2 Resistance to Fire

Resistance to Fire of the product has not been determined, but it is unlikely that Boost$^R$ Hybrid will contribute to the fire resistance of the structure. Where required, fire performance shall be determined for the structure as a whole.

### 10.2.3 Hygiene, Health and Environment

#### 10.2.3.1 Risk of Condensation

The risk of condensation occurring within the roof/wall will depend upon the thermal properties and vapour resistance of other materials in the construction, the internal and external conditions and the effectiveness of the internal VCL.

Boost$^R$ Hybrid can help prevent surface or interstitial condensation by allowing water vapour to escape from the structure. However, for each application, condensation risk calculations, as defined in BS 5250, shall be carried out to ensure that condensation will not occur to a harmful extent. The Boost$^R$ Hybrid water vapour resistance value of ≤ 0.55 MNs/g meets the “breather membrane” definition given in Clause 3.2 of BS 5250.

Guidance on the application of design principles for walls is given in Annex G of BS 5250 and for roofs is given in Annex H. Examples of typical condensation risk calculations are given in Annex 3. It is important that the calculations use the specific construction details, including timber fraction and appropriate climatic conditions, of each design in the calculations.

### 10.2.4 Safety in Use

Not relevant.

### 10.2.5 Protection against Noise

Protection against noise has not been evaluated. Where required, this shall be evaluated for the structure as a whole.

### 10.2.6 Energy Economy and Heat Retention

Although thermal resistance is outside the scope of BS EN 13859-1/2, test data has been provided to BM TRADA. The thermal performance of Boost$^R$ Hybrid has been measured in accordance with BS EN 16012 and the results are given in Table 7. This shows the declared emissivity and the thermal resistance with and without an air gap on either side.

Example U-value calculations for a number of constructions are given in Annex 3.

#### 10.2.6.1 Table 7: Thermal Performance

| Characteristic | | Units | Value |
|---|---|---|---|
| **Declared Emissivity (Outer/Inner Side)** | | **-** | **0.31/0.05** |
| Declared R-Value(1) | R value of Boost Hybrid (with 2 unventilated air gaps) | $m^2K/W$ | 2.40 |
| | Core R value of Boost Hybrid | $m^2K/W$ | 1.35 |

(1) *In accordance with BS EN 16012*

*Boost$^R$ Hybrid may also be available with alternative CE marked outer membranes, having different emissivity values to those shown in the table. This may affect the thermal performance of the outer air cavity and the Declaration of Performance for the outer membrane should be consulted in this case.*

#### 10.2.6.2 Thermal Performance of Compressed Product

When compressed between rafters / studs and battens, the compressed nominal thickness of Boost'R Hybrid has been determined as 7mm. The related R-value of the 7mm compressed product is 0.22 $m^2K/W$ (determined in accordance with EN 12667).

### 10.3 Wind Uplift

Boost$^R$ Hybrid has been tested for wind uplift in accordance with Annex A of BS 5534. The results demonstrate that Boost$^R$ Hybrid may be used in Zones 1 to 5 subject to the limits shown in Table 8.

#### 10.3.1.1 Table 8: Wind Uplift

| Wind Uplift Assessment | Geographical Wind Zone | |
|---|---|---|
| **Underlay type** | **345mm batten gauge** | **250mm batten gauge** |
| Boost$^R$ Hybrid / Boost$^R$ Hybrid Roof with taped lap | Zones 1 to 5 | Zones 1 to 5 |
| Boost$^R$ Hybrid / Boost$^R$ Hybrid Roof with taped lap and counter batten | Zones 1 to 5 | Zones 1 to 5 |

### 10.4 Aspects of Durability

Boost$^R$ Hybrid will remain an effective roof underlay / wall membrane for the service life of the building provided that it is installed in accordance with the manufacturer's instructions and the provisions of this certificate.

## 11 IDENTIFICATION AND USE OF THE BM TRADA AND Q-MARK LOGOS

Correct identification of approved construction products is vital in order that purchasers and controlling authorities clearly understand the status of products presented to them. It is therefore a requirement that all products or at least the packaging of the products, covered under the scheme are identified as "BM TRADA Q-Mark Certified" or with other similar wording, and/or display the Q-Mark logo. This will assist subsequent inspection authorities to recognise acceptable products. For similar reasons, Members are encouraged to make use of the Marks on marketing and Technical documentation.

## 12 GUARANTEES

The Scheme makes no requirement on its Members to give a minimum guarantee. This is entirely up to the discretion of the Member.

## 13 ANNEX 1: EVIDENCE/DOCUMENTS USED IN THIS ASSESSMENT

1. Eurofins Expert Services Ltd - Certificate Number C-9328-13, Dated 14/12/2018
2. ACTIS Technical Report, Reference 12-18, Dated 19/11/2012
3. BRE Test Report, Reference b137751-01, Issue 2, Dated 09/07/15

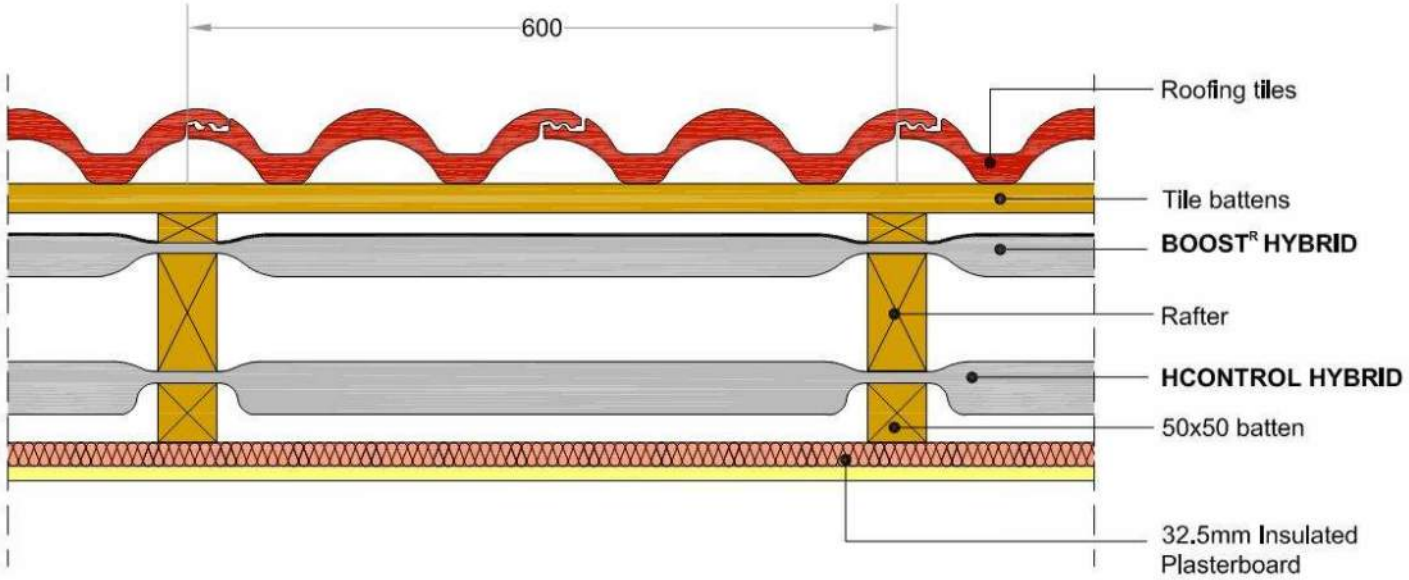
# 14 ANNEX 2: NORMATIVE REFERENCES

| | |
|---|---|
| BS EN 1107-2:2001 | Flexible Sheets for Waterproofing. Determination of Dimensional Stability. Plastic and rubber sheets for roof waterproofing. |
| BS EN 1849-2:2001 | Flexible Sheets for Waterproofing. Determination of thickness and mass per unit area. Plastic and rubber sheets for roof waterproofing |
| BS EN 12310-2:2000 | Flexible Sheets for Waterproofing. Determination of Resistance to tearing (nail shank). Plastic and rubber sheets for roof waterproofing. |
| BS EN 12311-2:2000 | Flexible Sheets for Waterproofing. Determination of Tensile Properties. Plastic and rubber sheets for roof waterproofing. |
| BS EN 13111-2:2001 | Flexible Sheets for Waterproofing. Underlay's for discontinuous roofing and walls. Determination of Resistance to water penetration |
| BS EN 13859:2010 | Flexible Sheets for Waterproofing. Definitions and Characteristics for Underlay's. Underlay's for Walls |
| BS EN ISO 6946:1997 | Building Components and Building Elements. Thermal Resistance and thermal transmittance. Calculation method. |
| BS EN ISO 12572:2001 | Hygrothermal performance of building materials and products. Determination of water vapour transmission properties. |
| BS EN ISO 13788:2002 | Hygrothermal performance of building components and building elements. Internal surface temperature to avoid critical surface humidity and interstitial condensation. Calculation method. |
| BS 5250:2011 | Code of practice for control of condensation in buildings. |
| BS EN 16012:2012 | Thermal insulation for buildings. Reflective insulation products. Determination of the declared thermal performance |
| BS 5534:2014 | Slating and tiling for pitched roofs and vertical cladding – Code of Practice: Annex A – Method of test and classification of roof underlays for wind uplift resistance. |

# 15 ANNEX 3: EXAMPLE U-VALUE AND CONDENSATION RISK CALCULATIONS

The following example sections show typical design details and calculation of U-values and condensation risks, which have been independently verified by BM TRADA.

- Unventilated pitched roof with Boost$^{R}$ Hybrid and HControl Hybrid
- Timber frame wall Boost$^{R}$ Hybrid and HControl Hybrid
- Suspended Timber Floor
- Various combinations of Boost$^{R}$ Hybrid, HControl Hybrid and Hybris with other membranes in pitched roofs with OSB sarking




Roof 4: 600mm rafter spacing - Non ventilated pitched roof
BOOST'R HYBRID
HCONTROL HYBRID
32.5mm INSULATED PLASTERBOARD
U-VALUE = 0.18 W/m²K

# UVALUE CALCULATION

**Users Ref:** Actis Pack - UK Configurations **Issued on:** 26.February.2013

**Prop Type Ref:**

**Property:** **Carbon Index:** 0.0

**SAP Rating:** 0 **Fuel Bill:** £0.00 **CO2 Emissions:** 0.00 t/year

**Energy used:** 0.0 GJ per annum

Surveyor: ,
Address:
Client:

Software
SAP version: 0.00 Regs Region: England and Wales, Calculation Type: New Build
Calculation method: BS EN ISO 6946, BS EN ISO 13370, BS 5250

**Building Elements:**

**Building Element Roof 4 non vent - BRHybrid+HCRHybrid+25IPB= 0.18**

Roof Type: Pitched Roof, insulated sloping ceiling

| Layer | Description | Thickness | λ | R | Fraction |
|---|---|---|---|---|---|
| **External surface** | | | | 0.040 | |
| **Layer1** | **Tiling, concrete** | | | | |
| | Main construction | 15 mm | 1.500 | 0.010 | 100.00 % |
| **Layer2** | **25mm batten cavity** | | | | |
| | Main construction | 25 mm | 0.100 | 0.250 | 92.17 % |
| | Bridging - Timber | 25 mm | 0.130 | 0.000 | 7.83 % |
| **Layer3** | **BRHybrid** | | | | |
| | Main construction | 35 mm | 0.026 | 1.350 | 92.17 % |
| | Bridging - Timber | 35 mm | 0.130 | 0.000 | 7.83 % |
| **Layer4** | **Rafter cavity** | | | | |
| | Main construction | 85 mm | 0.131 | 0.650 | 92.17 % |
| | Bridging - Timber | 85 mm | 0.130 | 0.000 | 7.83 % |
| **Layer5** | **HRHybrid** | | | | |
| | Main construction | 45 mm | 0.024 | 1.900 | 92.17 % |
| | Corrections - Air Gap: Level 0, Fasteners: None or plastic | | | | |
| | Bridging - Timber | 45 mm | 0.130 | 0.000 | 7.83 % |
| **Layer6** | **50mm batten cavity** | | | | |
| | Main construction | 20 mm | 0.031 | 0.650 | 92.17 % |
| | Bridging - Timber | 20 mm | 0.130 | 0.000 | 7.83 % |
| **Layer7** | **PU bonded to plasterboard** | | | | |
| | Main construction | 25 mm | 0.021 | 1.190 | 100.00 % |
| | Corrections - Air Gap: Level 0, Fasteners: None or plastic | | | | |
| **Layer8** | **Plasterboard, standard** | | | | |
| | Main construction | 13 mm | 0.066 | 0.190 | 100.00 % |
| **Internal surface** | | | | 0.100 | |

**Total resistance:** Upper limit = 6.024 m²K/W Lower limit = 5.377 m²K/W Average = 5.701 m²K/W

U-value (unrounded) = 0.1754 W/m²K

Unheated space: None

**Total thickness: 263 mm** **U-value: 0.18 W/m²K**

# CONDENSATION RISK ANALYSIS

**Users Ref:** Actis Pack - UK Configurations

**Issued on:** 26.February.2013

**Prop Type Ref:**

**Property:**

**Carbon Index:** 0.0

**SAP Rating:** 0 **Fuel Bill:** £0.00 **CO2 Emissions:** 0.00 t/year

**Energy used:** 0.0 GJ per annum

Surveyor: ,
Address:
Client:

Software
SAP version: 0.00 Regs Region: England and Wales, Calculation Type: New Build
Calculation method: BS EN ISO 6946, BS EN ISO 13370, BS 5250

**Roof 4 non vent - BRHybrid+HCRHybrid+25IPB= 0.18**

**Environmental conditions:**

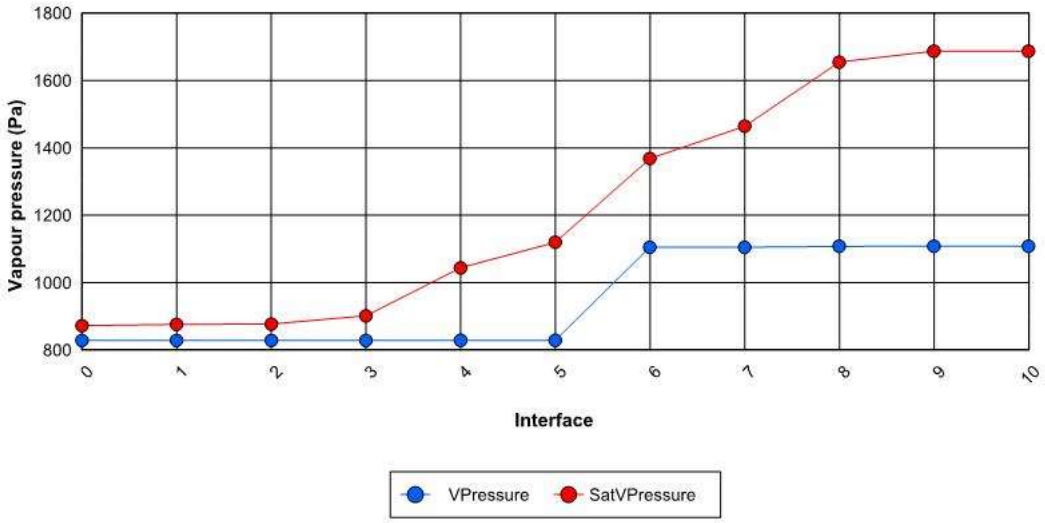
| | | |
|---|---|---|
| External conditions: | Temperature: 5 °C | Relative Humidity: 95 % |
| Internal conditions: | Temperature: 15 °C | Relative Humidity: 65 % |

**Table of layers:**

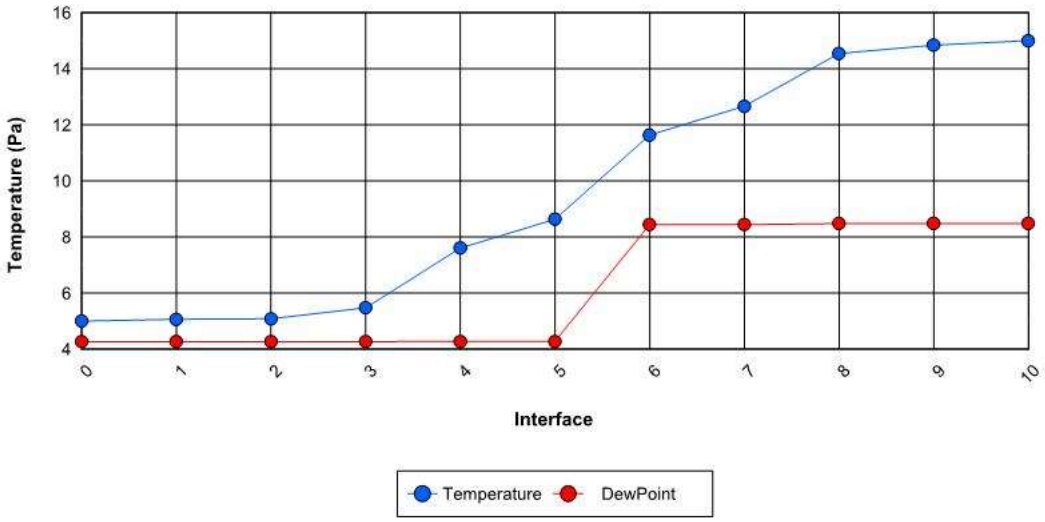
| Layer | Width mm | Thermal conduct. W/m.K | Thermal resistance m2.K/W | Cumulative thermal resistance m2.K/W | Vapour resistivity GN.s/kg.m | Vapour resistance GN.s/kg | Cumulative vapour resistance GN.s/kg |
|---|---|---|---|---|---|---|---|
| External surface | - | 0.000 | 0.040 | 0.040 | 0.000 | 0.000 | 0.00 |
| 1. Tiling, concrete | 15.0 | 1.500 | 0.010 | 0.050 | 0.000 | 0.000 | 0.00 |
| 2. 25mm batten cavity | 25.0 | 0.100 | 0.250 | 0.300 | 0.000 | 0.000 | 0.00 |
| 3. BRHybrid | 35.0 | 0.000 | 1.350 | 1.650 | 0.000 | 0.60 | 0.60 |
| 4. Rafter cavity | 85.0 | 0.000 | 0.650 | 2.300 | 0.000 | 0.000 | 0.60 |
| 5. HRHybrid | 45.0 | 0.000 | 1.900 | 4.200 | 0.000 | 1,000.00 | 1,000.60 |
| 6. 50mm batten cavity | 20.0 | 0.000 | 0.650 | 4.850 | 0.000 | 0.000 | 1,000.60 |
| 7. PU bonded to plasterboard | 25.0 | 0.021 | 1.190 | 6.040 | 400.0 | 10.00 | 1,010.60 |
| 8. Plasterboard, standard | 12.5 | 0.066 | 0.190 | 6.230 | 45.0 | 0.56 | 1,011.16 |
| Internal surface | - | 0.000 | 0.100 | 6.230 | 0.000 | 0.000 | 1,011.16 |

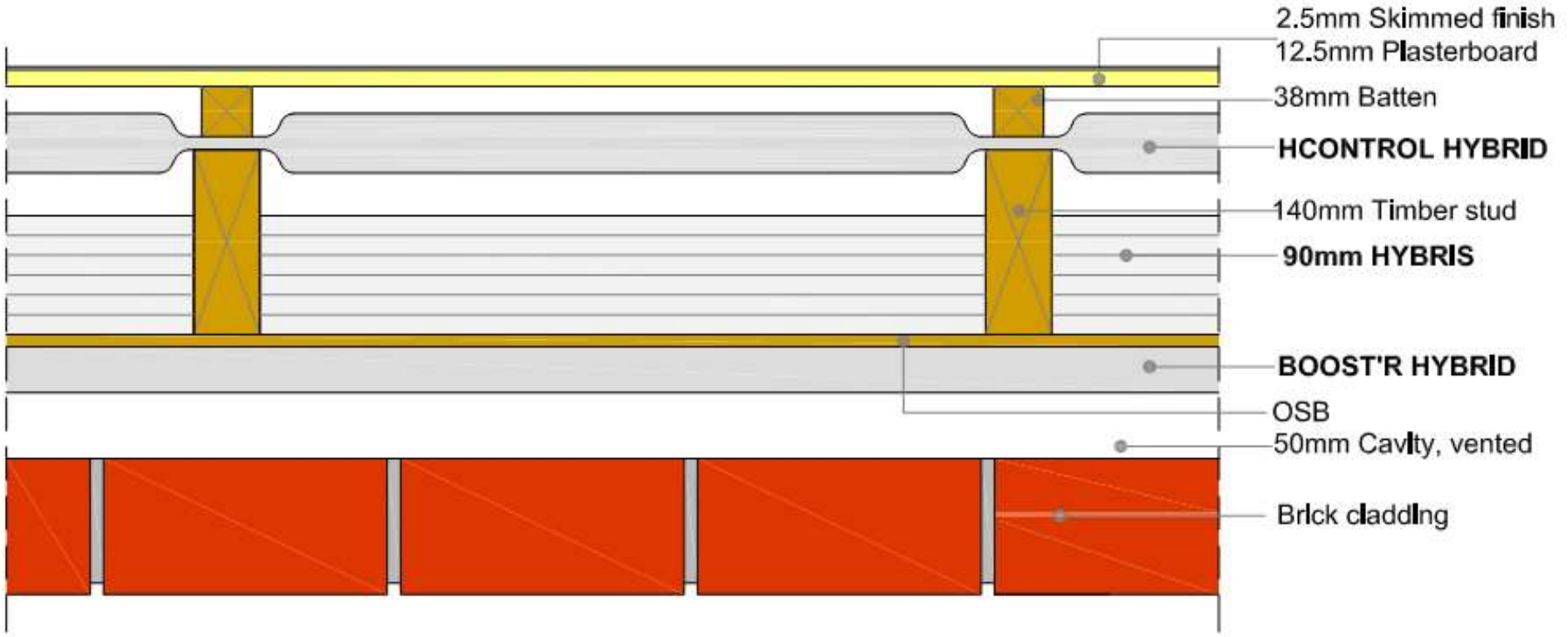
**Vapour pressure table:**

| Interface - between layers | Interface temp. °C | Vapour pressure Pa | Satur. vapour pressure Pa | Dew point °C | Cond. rate g/m2.h | Cond. rate 60 days g/m2.h | Cond. risk Y/N |
|---|---|---|---|---|---|---|---|
| External surface | 5.00 | 828.3 | 871.9 | 4.27 | 0.00 | 0.00 | No |
| 1. External surface / Tiling, concrete | 5.06 | 828.3 | 875.7 | 4.27 | 0.00 | 0.00 | No |
| 2. Tiling, concrete / 25mm batten cavity | 5.08 | 828.3 | 876.7 | 4.27 | 0.00 | 1.43 | No |
| 3. 25mm batten cavity / BRHybrid | 5.47 | 828.3 | 901.1 | 4.27 | 0.00 | 1.43 | No |
| 4. BRHybrid / Rafter cavity | 7.61 | 828.4 | 1 043.8 | 4.27 | 0.00 | 0.00 | No |
| 5. Rafter cavity / HRHybrid | 8.63 | 828.4 | 1 119.3 | 4.27 | 0.00 | 0.00 | No |
| 6. HRHybrid / 50mm batten cavity | 11.63 | 1 104.9 | 1 368.4 | 8.44 | 0.00 | 0.00 | No |
| 7. 50mm batten cavity / PU bonded to plasterboard | 12.66 | 1 104.9 | 1 464.1 | 8.44 | 0.00 | 0.00 | No |
| 8. PU bonded to plasterboard / Plasterboard, standard | 14.54 | 1 107.7 | 1 654.8 | 8.48 | 0.00 | 0.00 | No |
| 9. Plasterboard, standard / Internal surface | 14.84 | 1 107.9 | 1 687.2 | 8.48 | 0.00 | 0.00 | No |
| Internal surface | 15.00 | 1 107.9 | 1 687.2 | 8.48 | 0.00 | 0.00 | No |



**Interface temperature / Dew point graphical representation:**






PF23:
Timber Frame Wall
U-value = 0.14 W/m²K

# UVALUE CALCULATION

**Users Ref:** 00 PATHFINDER 2014-09 **Issued on:** 17.November.2016

**Prop Type Ref:**

**Property:** **Carbon Index:** 0.0

**SAP Rating:** 0 **Fuel Bill:** £0.00 **CO2 Emissions:** 0.00 t/year

**Energy used:** 0.0 GJ per annum

Surveyor: ,
Address:
Client:

Software
SAP version: 0.00 Regs Region: England and Wales, Calculation Type: New Build
Calculation method: BS EN ISO 6946, BS EN ISO 13370, BS 5250

**Building Elements:**

**Building Element Wall PF23 - w-tf HCH+90H+BRH @600c =0.14**

| Layer | Description | Thickness | λ | R | Fraction |
|---|---|---|---|---|---|
| **External surface** | | | | 0.040 | |
| **Layer1** | **Brick, outer leaf** | | | | |
| | Main construction | 105 mm | 0.770 | 0.136 | 82.81 % |
| | Bridging - Mortar | 105 mm | 0.941 | 0.000 | 17.19 % |
| **Layer2** | **Air Gap vented, e=0.31** | | | | |
| | Main construction | 50 mm | 0.140 | 0.358 | 100.00 % |
| **Layer3** | **BoostR Hybrid** | | | | |
| | Main construction | 35 mm | 0.026 | 1.350 | 100.00 % |
| **Layer4** | **OSB** | | | | |
| | Main construction | 11 mm | 0.130 | 0.085 | 100.00 % |
| **Layer5** | **Hybris / Stud 140mm** | | | | |
| | Main construction | 90 mm | 0.033 | 2.727 | 85.00 % |
| | Corrections - Air Gap: Level 0, Fasteners: None or plastic | | | | |
| | Bridging - Timber | 90 mm | 0.130 | 0.000 | 15.00 % |
| **Layer6** | **Hybris - Associated Air Gap / Stud 140mm** | | | | |
| | Main construction | 28 mm | 0.038 | 0.717 | 85.00 % |
| | Bridging - Timber | 28 mm | 0.130 | 0.000 | 15.00 % |
| **Layer7** | **HControl Hybrid** | | | | |
| | Main construction | 45 mm | 0.024 | 1.900 | 90.50 % |
| | Bridging - Timber | 45 mm | 0.130 | 0.000 | 9.50 % |
| **Layer8** | **HControl Hybrid - Associated AirGap / Batten 38mm** | | | | |
| | Main construction | 20 mm | 0.031 | 0.650 | 90.50 % |
| | Bridging - Timber | 20 mm | 0.130 | 0.000 | 9.50 % |
| **Layer9** | **Plasterboard** | | | | |
| | Main construction | 13 mm | 0.190 | 0.066 | 100.00 % |
| **Layer10** | **Plaster, skim** | | | | |
| | Main construction | 3 mm | 0.400 | 0.006 | 100.00 % |
| **Internal surface** | | | | 0.130 | |

**Total resistance:** Upper limit = 7.456 m²K/W Lower limit = 6.416 m²K/W Average = 6.936 m²K/W
U-value (unrounded) = 0.1442 W/m²K

Unheated space: None

**Total thickness: 399 mm** **U-value: 0.14 W/m²K**

# CONDENSATION RISK ANALYSIS

**Users Ref:** 00 PATHFINDER 2014-09 **Issued on:** 17.November.2016

**Prop Type Ref:**

**Property:** **Carbon Index:** 0.0

**SAP Rating:** 0 **Fuel Bill:** £0.00 **CO2 Emissions:** 0.00 t/year

**Energy used:** 0.0 GJ per annum

Surveyor: ,
Address:
Client:

Software
SAP version: 0.00 Regs Region: England and Wales, Calculation Type: New Build
Calculation method: BS EN ISO 6946, BS EN ISO 13370, BS 5250

## Wall PF23 - w-tf HCH+90H+BRH @600c =0.14

### Environmental conditions:

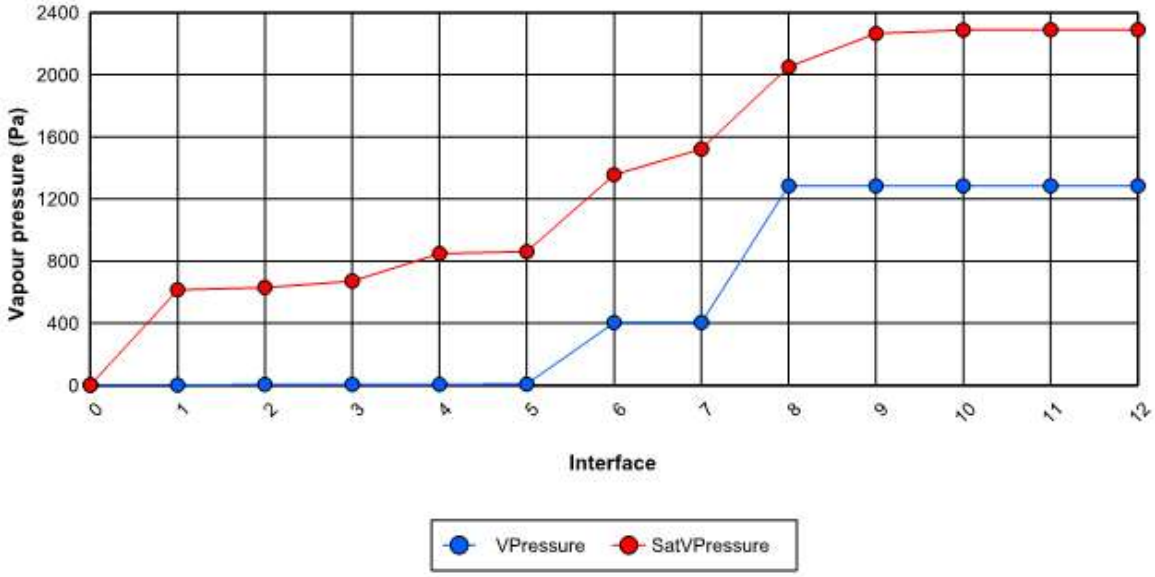
| | | |
|---|---|---|
| External conditions: | Temperature: 0 °C | Relative Humidity: 95 % |
| Internal conditions: | Temperature: 20 °C | Relative Humidity: 55 % |

### Table of layers:

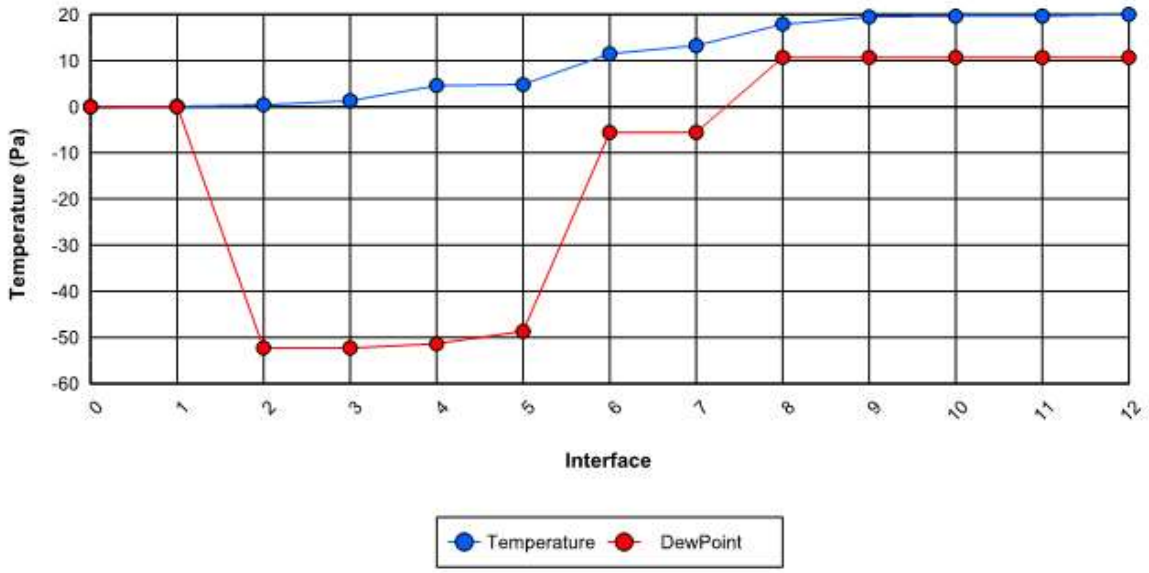
| Layer | Width mm | Thermal conduct. W/m.K | Thermal resistance m2.K/W | Cumulative thermal resistance m2.K/W | Vapour resistivity GN.s/kg.m | Vapour resistance GN.s/kg | Cumulative vapour resistance GN.s/kg |
|---|---|---|---|---|---|---|---|
| External surface | - | 0.000 | 0.040 | 0.040 | 0.000 | 0.000 | 0.00 |
| 1. Brick, outer leaf | 105.0 | 0.770 | 0.136 | 0.176 | 50.0 | 5.25 | 5.25 |
| 2. Air Gap vented, e=0.31 | 50.0 | 0.000 | 0.358 | 0.534 | 0.000 | 0.000 | 5.25 |
| 3. BoostR Hybrid | 35.0 | 0.000 | 1.350 | 1.884 | 0.000 | 0.60 | 5.85 |
| 4. OSB | 11.0 | 0.130 | 0.085 | 1.969 | 200.0 | 2.20 | 8.05 |
| 5. Hybris / Stud 140mm | 90.0 | 0.033 | 2.727 | 4.696 | 0.000 | 450.00 | 458.05 |
| 6. Hybris - Associated Air Gap / Stud 140mm | 27.5 | 0.000 | 0.717 | 5.413 | 0.000 | 0.000 | 458.05 |
| 7. HControl Hybrid | 45.0 | 0.000 | 1.900 | 7.313 | 0.000 | 1,000.00 | 1,458.05 |
| 8. HControl Hybrid - Associated AirGap / Batten | 20.0 | 0.000 | 0.650 | 7.963 | 0.000 | 0.000 | 1,458.05 |
| 9. Plasterboard | 12.5 | 0.190 | 0.066 | 8.029 | 40.0 | 0.50 | 1,458.55 |
| 10. Plaster, skim | 2.5 | 0.400 | 0.006 | 8.035 | 60.0 | 0.15 | 1,458.70 |
| Internal surface | - | 0.000 | 0.130 | 8.035 | 0.000 | 0.000 | 1,458.70 |

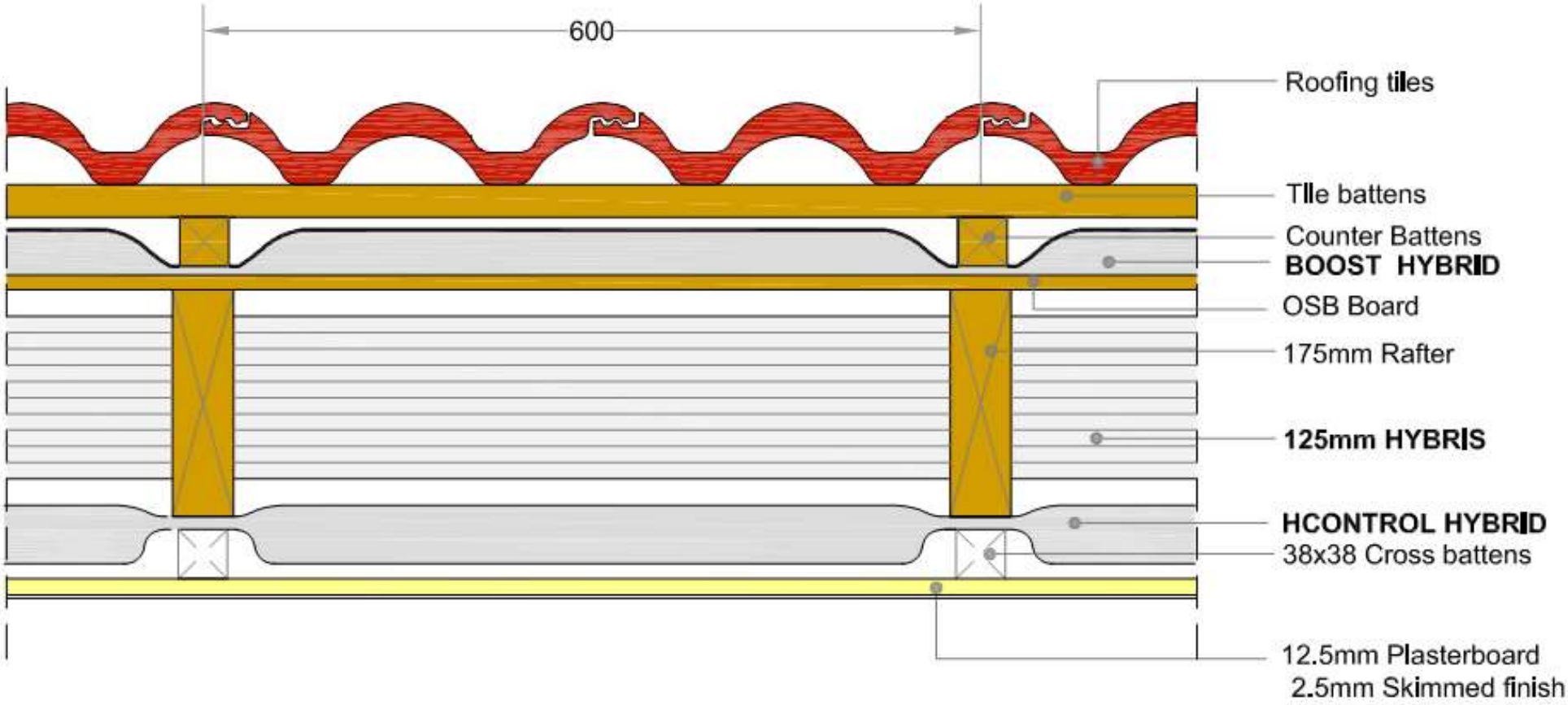
**Vapour pressure table:**

| Interface - between layers | Interface temp. °C | Vapour pressure Pa | Satur. vapour pressure Pa | Dew point °C | Cond. rate g/m2.h | Cond. rate 60 days g/m2.h | Cond. risk Y/N |
|---|---|---|---|---|---|---|---|
| External surface | 0.00 | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 | No |
| 1. External surface / Brick, outer leaf | 0.10 | 0.0 | 614.9 | 0.00 | 0.00 | 0.00 | No |
| 2. Brick, outer leaf / Air Gap vented, e=0.31 | 0.43 | 4.6 | 630.0 | -52.30 | 0.00 | 0.00 | No |
| 3. Air Gap vented, e=0.31 / BoostR Hybrid | 1.31 | 4.6 | 671.2 | -52.30 | 0.00 | 0.00 | No |
| 4. BoostR Hybrid / OSB | 4.62 | 5.2 | 848.7 | -51.40 | 0.00 | 0.00 | No |
| 5. OSB / Hybris / Stud 140mm | 4.82 | 7.1 | 861.1 | -48.66 | 0.00 | 0.00 | No |
| 6. Hybris / Stud 140mm / Hybris - Associated Air Gap / Stud 140mm | 11.50 | 403.6 | 1 356.5 | -5.55 | 0.00 | 0.00 | No |
| 7. Hybris - Associated Air Gap / Stud 140mm / HControl Hybrid | 13.26 | 403.6 | 1 522.5 | -5.55 | 0.00 | 0.00 | No |
| 8. HControl Hybrid / HControl Hybrid - Associated AirGap / Batten 38mm | 17.91 | 1 284.8 | 2 051.6 | 10.68 | 0.00 | 0.00 | No |
| 9. HControl Hybrid - Associated AirGap / Batten 38mm / Plasterboard | 19.51 | 1 284.8 | 2 266.3 | 10.68 | 0.00 | 0.00 | No |
| 10. Plasterboard / Plaster, skim | 19.67 | 1 285.2 | 2 289.1 | 10.69 | 0.00 | 0.00 | No |
| 11. Plaster, skim / Internal surface | 19.68 | 1 285.3 | 2 291.3 | 10.69 | 0.00 | 0.00 | No |
| Internal surface | 20.00 | 1 285.3 | 2 291.3 | 10.69 | 0.00 | 0.00 | No |



**Interface temperature / Dew point graphical representation:**






Pitched roof @ 600c

U-value = 0.13 W/m²K

# UVALUE CALCULATION

**Users Ref:** 00 TECHNICAL EXERCISES **Issued on:** 31.July.2017

**Prop Type Ref:**

**Property:** **Carbon Index:** 0.0

**SAP Rating:** 0 **Fuel Bill:** £0.00 **CO2 Emissions:** 0.00 t/year

**Energy used:** 0.0 GJ per annum

Surveyor: ,
Address:
Client:

Software
SAP version: 0.00 Regs Region: England and Wales, Calculation Type: New Build
Calculation method: BS EN ISO 6946, BS EN ISO 13370, BS 5250

**Building Elements:**

**Building Element Roof TE1078 - r-tp HCH+H125+BRH@600c=0.13**

Roof Type: Pitched Roof, insulated sloping ceiling

| Layer | Description | Thickness | λ | R | Fraction |
|---|---|---|---|---|---|
| **External surface** | | | | 0.100 | |
| **Layer1** | **Tiling, clay** | | | | |
| | Main construction | 15 mm | 1.000 | 0.000 | 100.00 % |
| **Layer2** | **Tile battens cavity** | | | | |
| | Main construction | 25 mm | 0.250 | 0.000 | 87.33 % |
| | Corrections - Cavity Ventilated, Emissivity: Low 0.2 | | | | |
| | Bridging - Timber | 25 mm | 0.130 | 0.000 | 12.67 % |
| **Layer3** | **Counter Battens - 10mm residual cavity** | | | | |
| | Main construction | 10 mm | 0.100 | 0.000 | 93.67 % |
| | Corrections - Cavity Ventilated, Emissivity: Normal | | | | |
| | Bridging - Timber | 10 mm | 0.130 | 0.000 | 6.33 % |
| **Layer4** | ***Correction roof protected by wind, e=0.31** | | | | |
| | Main construction | 1 mm | 0.018 | 0.056 | 100.00 % |
| **Layer5** | **BoostR Hybrid** | | | | |
| | Main construction | 35 mm | 0.026 | 1.350 | 93.67 % |
| | Bridging - Timber | 35 mm | 0.130 | 0.000 | 6.33 % |
| **Layer6** | **OSB** | | | | |
| | Main construction | 11 mm | 0.130 | 0.085 | 100.00 % |
| **Layer7** | **Hybris - Associated Air Gap / Rafter 175mm** | | | | |
| | Main construction | 21 mm | 0.050 | 0.407 | 92.17 % |
| | Bridging - Timber | 21 mm | 0.130 | 0.000 | 7.83 % |
| **Layer8** | **Hybris / Rafter 175mm** | | | | |
| | Main construction | 125 mm | 0.033 | 3.788 | 92.17 % |
| | Corrections - Air Gap: Level 0, Fasteners: None or plastic | | | | |
| | Bridging - Timber | 125 mm | 0.130 | 0.000 | 7.83 % |
| **Layer9** | **Hybris - Associated Air Gap / Rafter 175mm** | | | | |
| | Main construction | 21 mm | 0.043 | 0.474 | 92.17 % |
| | Bridging - Timber | 21 mm | 0.130 | 0.000 | 7.83 % |
| **Layer10** | **HControl Hybrid** | | | | |
| | Main construction | 45 mm | 0.024 | 1.900 | 93.67 % |
| | Bridging - Timber | 45 mm | 0.130 | 0.000 | 6.33 % |
| **Layer11** | **HControl Hybrid - Associated Air Gap / Batten 50mm** | | | | |
| | Main construction | 11 mm | 0.028 | 0.388 | 93.67 % |
| | Bridging - Timber | 11 mm | 0.130 | 0.000 | 6.33 % |
| **Layer12** | **Plasterboard** | | | | |
| | Main construction | 13 mm | 0.190 | 0.066 | 100.00 % |

# UVALUE CALCULATION

**Users Ref:** 00 TECHNICAL EXERCISES **Issued on:** 31.July.2017

**Prop Type Ref:**

**Property:** **Carbon Index:** 0.0

**SAP Rating:** 0 **Fuel Bill:** £0.00 **CO2 Emissions:** 0.00 t/year

**Energy used:** 0.0 GJ per annum

Surveyor: ,
Address:
Client:

Software
SAP version: 0.00 Regs Region: England and Wales, Calculation Type: New Build
Calculation method: BS EN ISO 6946, BS EN ISO 13370, BS 5250

**Building Elements:**

**Building Element Roof TE1078 - r-tp HCH+H125+BRH@600c=0.13**

Roof Type: Pitched Roof, insulated sloping ceiling

| Layer | Description | Thickness | λ | R | Fraction |
|---|---|---|---|---|---|
| **External surface** | | | | 0.100 | |
| **Layer13** | **Plaster, skim** | | | | |
| | Main construction | 3 mm | 0.400 | 0.006 | 100.00 % |
| **Internal surface** | | | | 0.100 | |

**Total resistance:** Upper limit = 8.135 m²K/W Lower limit = 7.136 m²K/W Average = 7.635 m²K/W

U-value (unrounded) = 0.1310 W/m²K

Unheated space: None

**Total thickness: 334 mm** **U-value: 0.13 W/m²K**

# CONDENSATION RISK ANALYSIS

**Users Ref:** 00 TECHNICAL EXERCISES **Issued on:** 31.July.2017

**Prop Type Ref:**

**Property:** **Carbon Index:** 0.0

**SAP Rating:** 0 **Fuel Bill:** £0.00 **CO2 Emissions:** 0.00 t/year

**Energy used:** 0.0 GJ per annum

Surveyor: ,
Address:
Client:

Software
SAP version: 0.00 Regs Region: England and Wales, Calculation Type: New Build
Calculation method: BS EN ISO 6946, BS EN ISO 13370, BS 5250

## Roof TE1078 - r-tp HCH+H125+BRH@600c=0.13

### Environmental conditions:

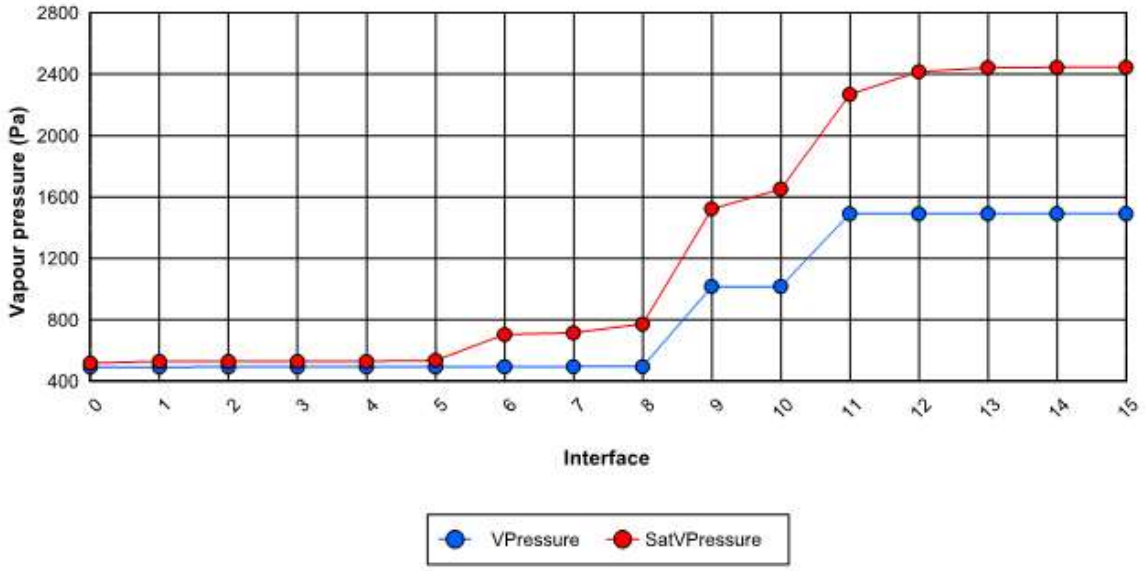
| | | |
|---|---|---|
| External conditions: | Temperature: -2 °C | Relative Humidity: 95 % |
| Internal conditions: | Temperature: 21 °C | Relative Humidity: 60 % |

### Table of layers:

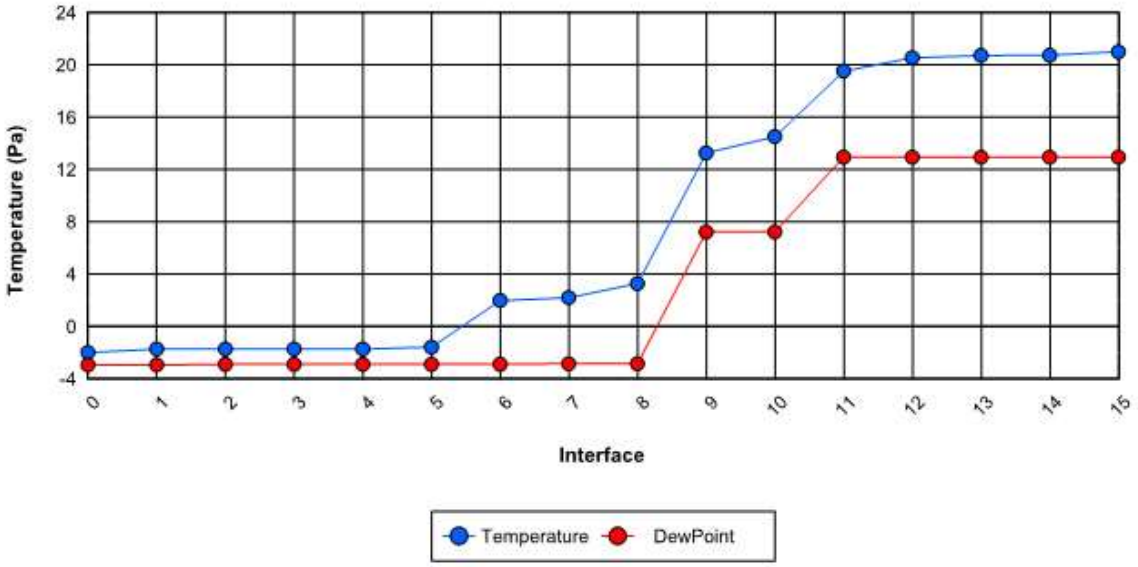
| Layer | Width mm | Thermal conduct. W/m.K | Thermal resistance m2.K/W | Cumulative thermal resistance m2.K/W | Vapour resistivity GN.s/kg.m | Vapour resistance GN.s/kg | Cumulative vapour resistance GN.s/kg |
|---|---|---|---|---|---|---|---|
| External surface | - | 0.000 | 0.100 | 0.100 | 0.000 | 0.000 | 0.00 |
| 1. Tiling, clay | 15.0 | 1.000 | 0.000 | 0.100 | 250.0 | 3.75 | 3.75 |
| 2. Tile battens cavity | 25.0 | 0.000 | 0.000 | 0.100 | 0.000 | 0.000 | 3.75 |
| 3. Counter Battens - 10mm residual cavity | 10.0 | 0.000 | 0.000 | 0.100 | 0.000 | 0.000 | 3.75 |
| 4. *Correction roof protected by wind, e=0.31 | 1.0 | 0.000 | 0.056 | 0.156 | 0.000 | 0.000 | 3.75 |
| 5. BoostR Hybrid | 35.0 | 0.000 | 1.350 | 1.506 | 0.000 | 0.60 | 4.35 |
| 6. OSB | 11.0 | 0.130 | 0.085 | 1.591 | 250.0 | 2.75 | 7.10 |
| 7. Hybris - Associated Air Gap / Rafter 175mm | 20.5 | 0.000 | 0.407 | 1.998 | 0.000 | 0.000 | 7.10 |
| 8. Hybris / Rafter 175mm | 125.0 | 0.033 | 3.788 | 5.785 | 0.000 | 1,100.00 | 1,107.10 |
| 9. Hybris - Associated Air Gap / Rafter 175mm | 20.5 | 0.000 | 0.474 | 6.259 | 0.000 | 0.000 | 1,107.10 |
| 10. HControl Hybrid | 45.0 | 0.000 | 1.900 | 8.159 | 0.000 | 1,000.00 | 2,107.10 |
| 11. HControl Hybrid - Associated Air Gap / Batte | 11.0 | 0.000 | 0.388 | 8.547 | 0.000 | 0.000 | 2,107.10 |
| 12. Plasterboard | 12.5 | 0.190 | 0.066 | 8.613 | 45.0 | 0.56 | 2,107.66 |
| 13. Plaster, skim | 2.5 | 0.400 | 0.006 | 8.620 | 60.0 | 0.15 | 2,107.81 |
| Internal surface | - | 0.000 | 0.100 | 8.620 | 0.000 | 0.000 | 2,107.81 |

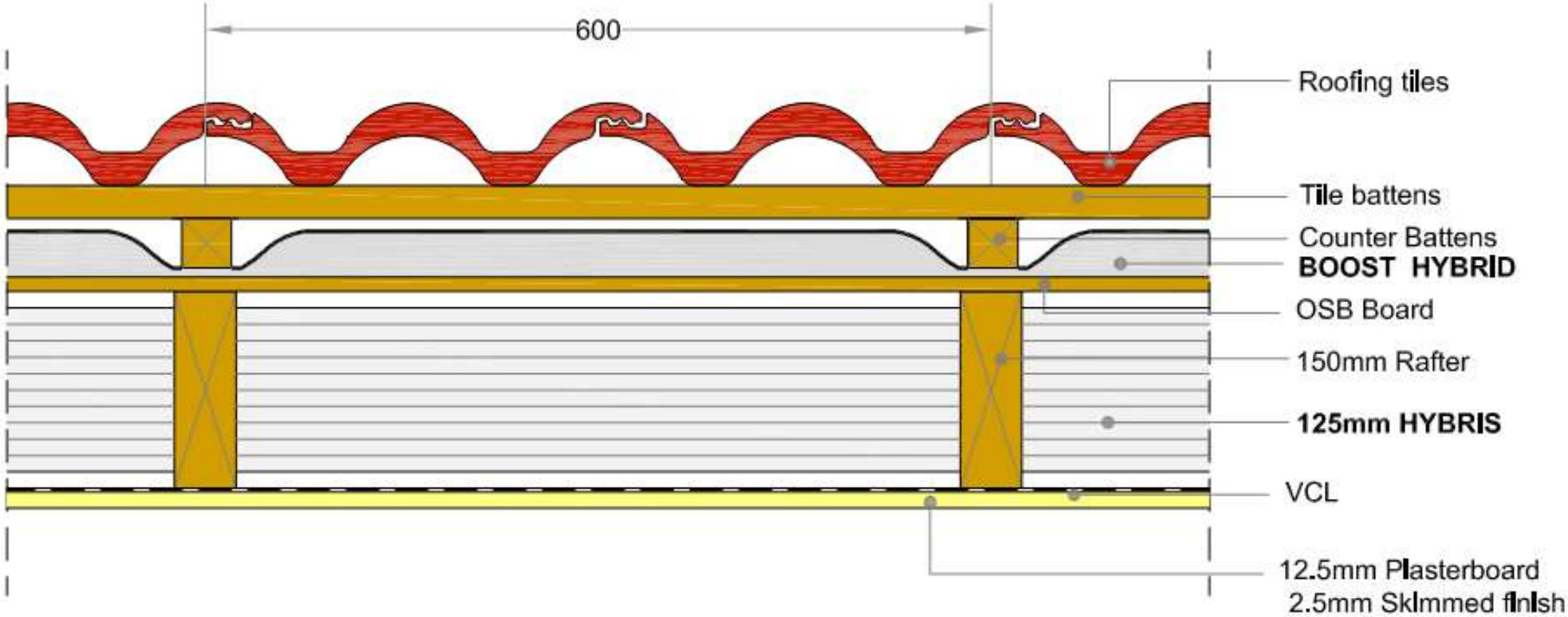
**Vapour pressure table:**

| Interface - between layers | Interface temp. °C | Vapour pressure Pa | Satur. vapour pressure Pa | Dew point °C | Cond. rate g/m2.h | Cond. rate 60 days g/m2.h | Cond. risk Y/N |
|---|---|---|---|---|---|---|---|
| External surface | -2.00 | 491.2 | 517.1 | -2.95 | 0.00 | 0.00 | No |
| 1. External surface / Tiling, clay | -1.74 | 491.2 | 528.6 | -2.95 | 0.00 | 0.00 | No |
| 2. Tiling, clay / Tile battens cavity | -1.74 | 493.0 | 528.6 | -2.90 | 0.00 | 0.00 | No |
| 3. Tile battens cavity / Counter Battens - 10mm residual cavity | -1.74 | 493.0 | 528.6 | -2.90 | 0.00 | 0.00 | No |
| 4. Counter Battens - 10mm residual cavity / *Correction roof protected by v | -1.74 | 493.0 | 528.6 | -2.90 | 0.00 | 0.00 | No |
| 5. *Correction roof protected by wind, e=0.31 / BoostR Hybrid | -1.59 | 493.0 | 535.2 | -2.90 | 0.00 | 0.00 | No |
| 6. BoostR Hybrid / OSB | 1.97 | 493.3 | 703.9 | -2.89 | 0.00 | 0.00 | No |
| 7. OSB / Hybris - Associated Air Gap / Rafter 175mm | 2.20 | 494.6 | 715.2 | -2.86 | 0.00 | 0.00 | No |
| 8. Hybris - Associated Air Gap / Rafter 175mm / Hybris / Rafter 175mm | 3.27 | 494.6 | 772.0 | -2.86 | 0.00 | 0.00 | No |
| 9. Hybris / Rafter 175mm / Hybris - Associated Air Gap / Rafter 175mm | 13.26 | 1 016.5 | 1 522.7 | 7.22 | 0.00 | 0.00 | No |
| 10. Hybris - Associated Air Gap / Rafter 175mm / HControl Hybrid | 14.51 | 1 016.5 | 1 651.5 | 7.22 | 0.00 | 0.00 | No |
| 11. HControl Hybrid / HControl Hybrid - Associated Air Gap / Batten 50mm | 19.52 | 1 491.0 | 2 268.8 | 12.94 | 0.00 | 0.00 | No |
| 12. HControl Hybrid - Associated Air Gap / Batten 50mm / Plasterboard | 20.55 | 1 491.0 | 2 417.1 | 12.94 | 0.00 | 0.00 | No |
| 13. Plasterboard / Plaster, skim | 20.72 | 1 491.3 | 2 443.1 | 12.94 | 0.00 | 0.00 | No |
| 14. Plaster, skim / Internal surface | 20.74 | 1 491.3 | 2 445.6 | 12.94 | 0.00 | 0.00 | No |
| Internal surface | 21.00 | 1 491.3 | 2 445.6 | 12.94 | 0.00 | 0.00 | No |

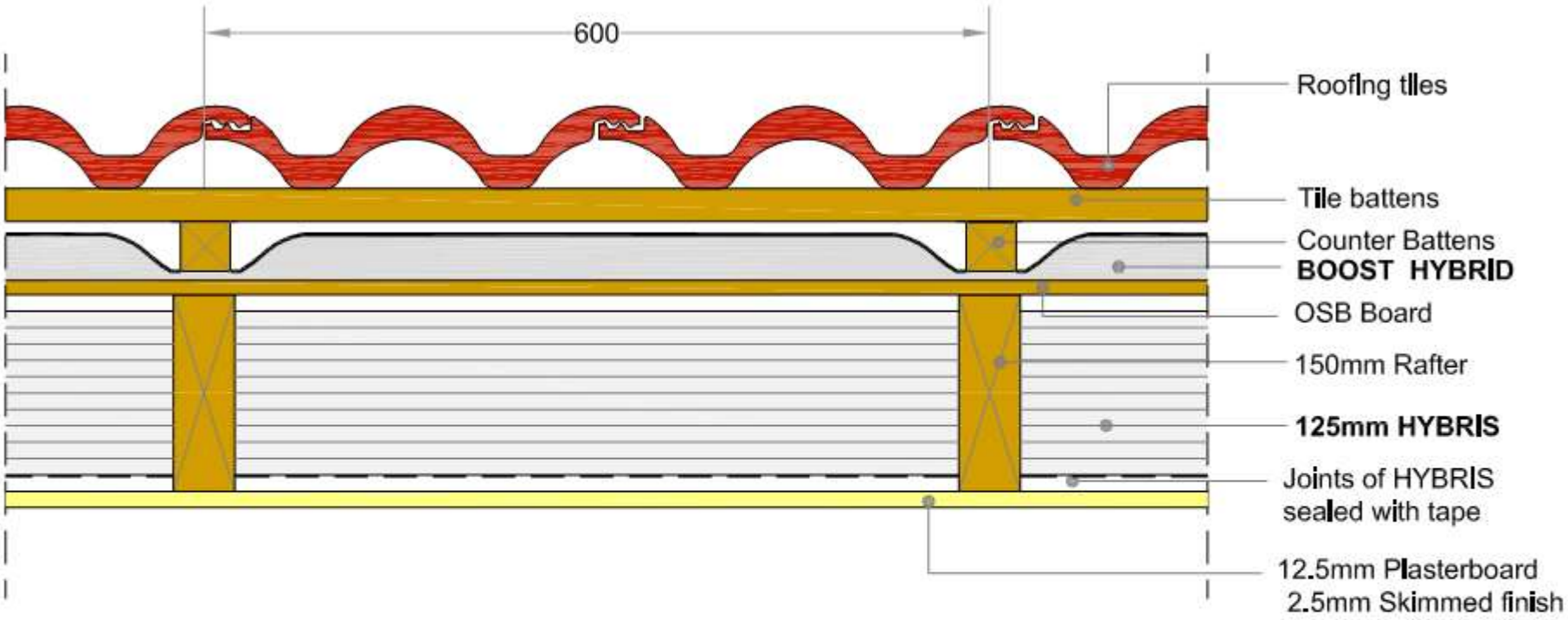


**Interface temperature / Dew point graphical representation:**






Pitched roof @ 600c
U-value = 0.18 W/m²K




Pitched roof @ 600c
U-value = 0.18 W/m²K

# UVALUE CALCULATION

**Users Ref:** 00 TECHNICAL EXERCISES **Issued on:** 31.July.2017

**Prop Type Ref:**

**Property:** **Carbon Index:** 0.0

**SAP Rating:** 0 **Fuel Bill:** £0.00 **CO2 Emissions:** 0.00 t/year

**Energy used:** 0.0 GJ per annum

Surveyor: ,
Address:
Client:

Software
SAP version: 0.00 Regs Region: England and Wales, Calculation Type: New Build
Calculation method: BS EN ISO 6946, BS EN ISO 13370, BS 5250

**Building Elements:**

**Building Element Roof TE1079 - r-tp H125+BRH@600c=0.18**

Roof Type: Pitched Roof, insulated sloping ceiling

| Layer | Description | Thickness | λ | R | Fraction |
|---|---|---|---|---|---|
| **External surface** | | | | 0.100 | |
| **Layer1** | **Tiling, clay** | | | | |
| | Main construction | 15 mm | 1.000 | 0.000 | 100.00 % |
| **Layer2** | **Tile battens cavity** | | | | |
| | Main construction | 25 mm | 0.250 | 0.000 | 87.33 % |
| | Corrections - Cavity Ventilated, Emissivity: Low 0.2 | | | | |
| | Bridging - Timber | 25 mm | 0.130 | 0.000 | 12.67 % |
| **Layer3** | **Counter Battens - 10mm residual cavity** | | | | |
| | Main construction | 10 mm | 0.100 | 0.000 | 93.67 % |
| | Corrections - Cavity Ventilated, Emissivity: Normal | | | | |
| | Bridging - Timber | 10 mm | 0.130 | 0.000 | 6.33 % |
| **Layer4** | ***Correction roof protected by wind, e=0.31** | | | | |
| | Main construction | 1 mm | 0.018 | 0.056 | 100.00 % |
| **Layer5** | **BoostR Hybrid** | | | | |
| | Main construction | 35 mm | 0.026 | 1.350 | 93.67 % |
| | Bridging - Timber | 35 mm | 0.130 | 0.000 | 6.33 % |
| **Layer6** | **OSB** | | | | |
| | Main construction | 11 mm | 0.130 | 0.085 | 100.00 % |
| **Layer7** | **Hybris - Associated Air Gap / Rafter 150mm** | | | | |
| | Main construction | 13 mm | 0.031 | 0.399 | 92.17 % |
| | Bridging - Timber | 13 mm | 0.130 | 0.000 | 7.83 % |
| **Layer8** | **Hybris / Rafter 150mm** | | | | |
| | Main construction | 125 mm | 0.033 | 3.788 | 92.17 % |
| | Corrections - Air Gap: Level 0, Fasteners: None or plastic | | | | |
| | Bridging - Timber | 125 mm | 0.130 | 0.000 | 7.83 % |
| **Layer9** | **Hybris - Associated Air Gap / Rafter 150mm** | | | | |
| | Main construction | 13 mm | 0.029 | 0.434 | 92.17 % |
| | Bridging - Timber | 13 mm | 0.130 | 0.000 | 7.83 % |
| **Layer10** | **Polythene, 500 gauge** | | | | |
| | Main construction | 0 mm | 0.000 | 0.000 | 100.00 % |
| **Layer11** | **Plasterboard** | | | | |
| | Main construction | 13 mm | 0.190 | 0.066 | 100.00 % |
| **Layer12** | **Plaster, skim** | | | | |
| | Main construction | 3 mm | 0.400 | 0.006 | 100.00 % |

# CONDENSATION RISK ANALYSIS

**Users Ref:** 00 TECHNICAL EXERCISES

**Issued on:** 31.July.2017

**Prop Type Ref:**

**Property:**

**Carbon Index:** 0.0

**SAP Rating:** 0

**Fuel Bill:** £0.00

**CO2 Emissions:** 0.00 t/year

**Energy used:** 0.0 GJ per annum

Surveyor: ,
Address:
Client:

Software
SAP version: 0.00 Regs Region: England and Wales, Calculation Type: New Build
Calculation method: BS EN ISO 6946, BS EN ISO 13370, BS 5250

## Roof TE1079 - r-tp H125+BRH@600c=0.18

### Environmental conditions:

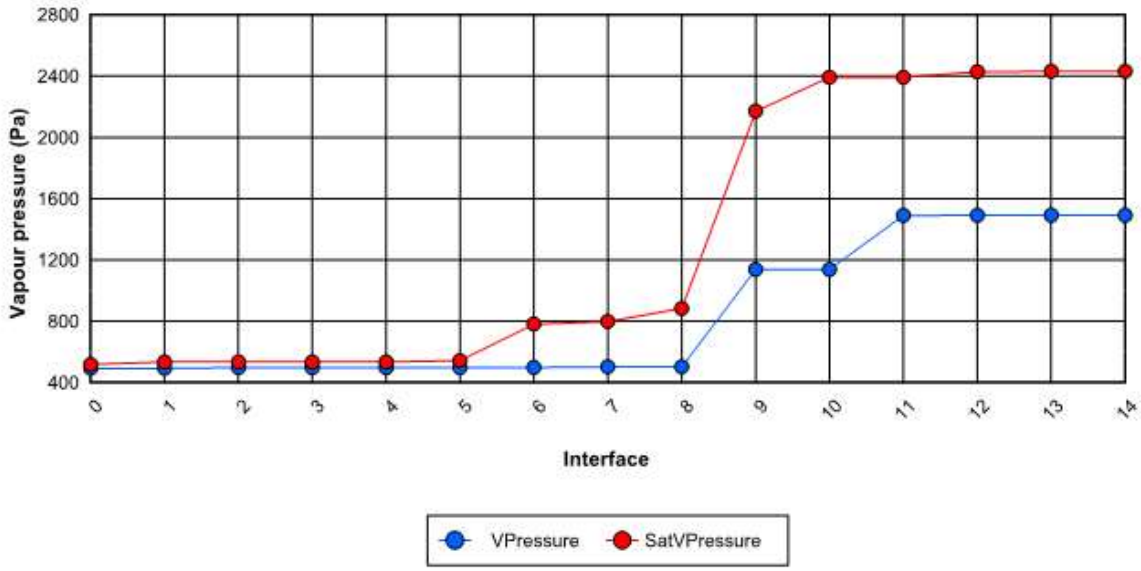
| | | |
|---|---|---|
| External conditions: | Temperature: -2 °C | Relative Humidity: 95 % |
| Internal conditions: | Temperature: 21 °C | Relative Humidity: 60 % |

### Table of layers:

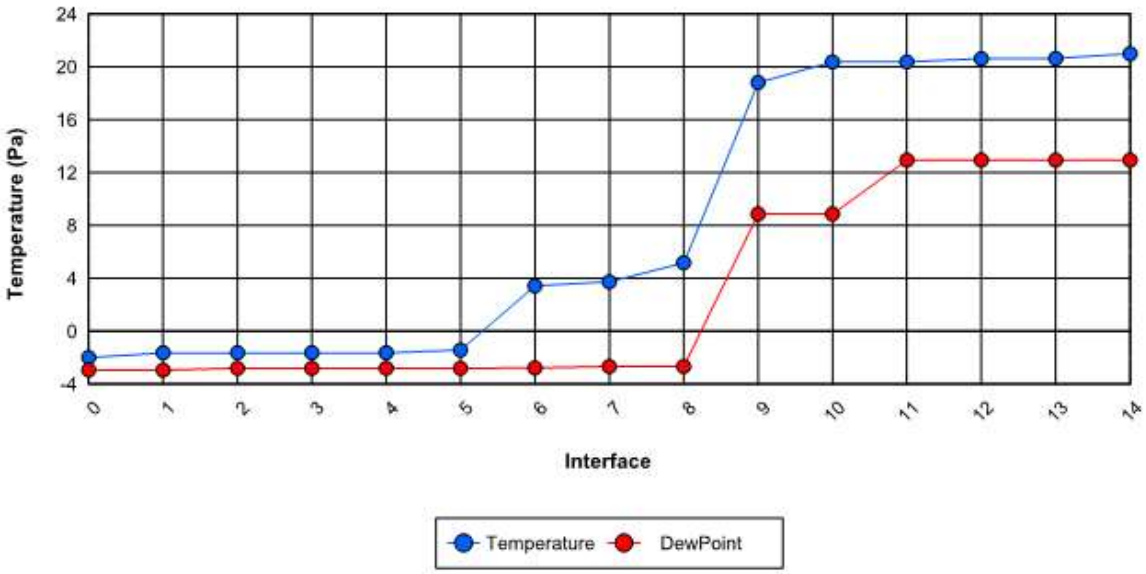
| Layer | Width mm | Thermal conduct. W/m.K | Thermal resistance m2.K/W | Cumulative thermal resistance m2.K/W | Vapour resistivity GN.s/kg.m | Vapour resistance GN.s/kg | Cumulative vapour resistance GN.s/kg |
|---|---|---|---|---|---|---|---|
| External surface | - | 0.000 | 0.100 | 0.100 | 0.000 | 0.000 | 0.00 |
| 1. Tiling, clay | 15.0 | 1.000 | 0.000 | 0.100 | 250.0 | 3.75 | 3.75 |
| 2. Tile battens cavity | 25.0 | 0.000 | 0.000 | 0.100 | 0.000 | 0.000 | 3.75 |
| 3. Counter Battens - 10mm residual cavity | 10.0 | 0.000 | 0.000 | 0.100 | 0.000 | 0.000 | 3.75 |
| 4. *Correction roof protected by wind, e=0.31 | 1.0 | 0.000 | 0.056 | 0.156 | 0.000 | 0.000 | 3.75 |
| 5. BoostR Hybrid | 35.0 | 0.000 | 1.350 | 1.506 | 0.000 | 0.60 | 4.35 |
| 6. OSB | 11.0 | 0.130 | 0.085 | 1.591 | 250.0 | 2.75 | 7.10 |
| 7. Hybris - Associated Air Gap / Rafter 150mm | 12.5 | 0.000 | 0.399 | 1.990 | 0.000 | 0.000 | 7.10 |
| 8. Hybris / Rafter 150mm | 125.0 | 0.033 | 3.788 | 5.777 | 0.000 | 450.00 | 457.10 |
| 9. Hybris - Associated Air Gap / Rafter 150mm | 12.5 | 0.000 | 0.434 | 6.211 | 0.000 | 0.000 | 457.10 |
| 10. Polythene, 500 gauge | 0.3 | 0.000 | 0.000 | 6.211 | 0.000 | 250.00 | 707.10 |
| 11. Plasterboard | 12.5 | 0.190 | 0.066 | 6.277 | 45.0 | 0.56 | 707.66 |
| 12. Plaster, skim | 2.5 | 0.400 | 0.006 | 6.284 | 60.0 | 0.15 | 707.81 |
| Internal surface | - | 0.000 | 0.100 | 6.284 | 0.000 | 0.000 | 707.81 |

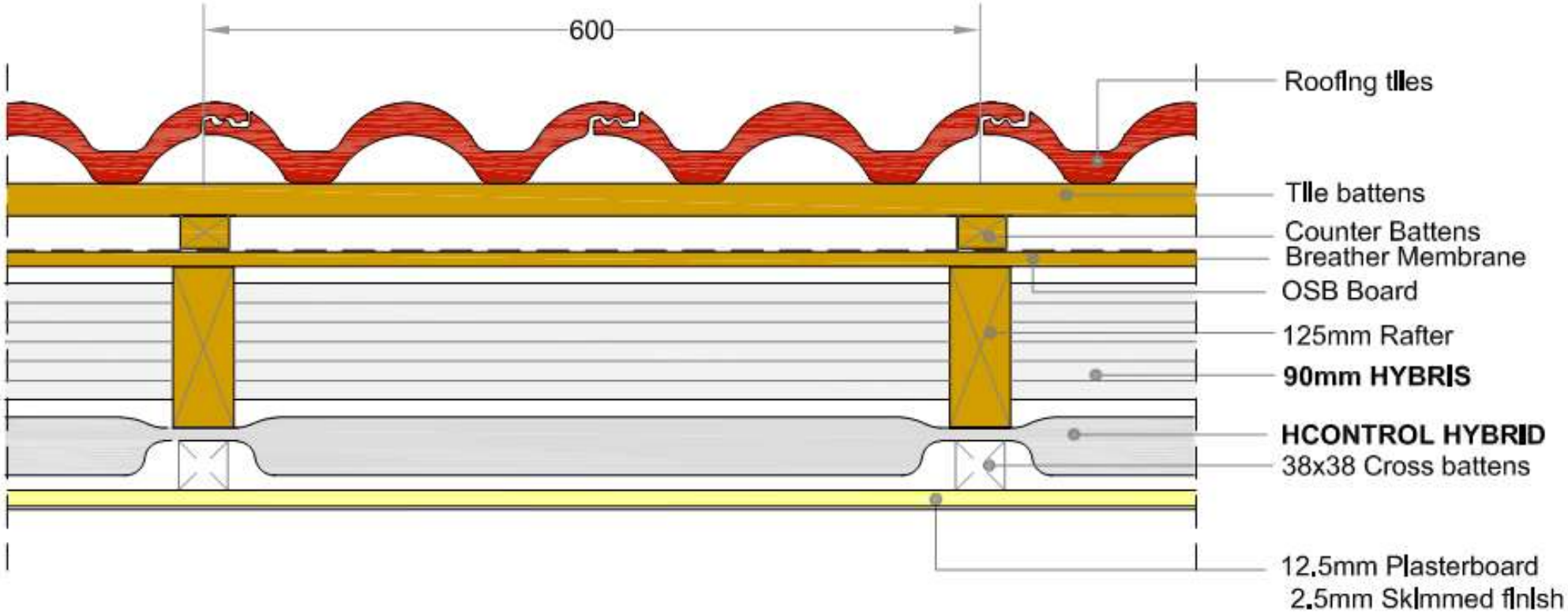
**Vapour pressure table:**

| Interface - between layers | Interface temp. °C | Vapour pressure Pa | Satur. vapour pressure Pa | Dew point °C | Cond. rate g/m2.h | Cond. rate 60 days g/m2.h | Cond. risk Y/N |
|---|---|---|---|---|---|---|---|
| External surface | -2.00 | 491.2 | 517.1 | -2.95 | 0.00 | 0.00 | No |
| 1. External surface / Tiling, clay | -1.64 | 491.2 | 532.9 | -2.95 | 0.00 | 0.00 | No |
| 2. Tiling, clay / Tile battens cavity | -1.64 | 496.5 | 532.9 | -2.81 | 0.00 | 0.00 | No |
| 3. Tile battens cavity / Counter Battens - 10mm residual cavity | -1.64 | 496.5 | 532.9 | -2.81 | 0.00 | 0.00 | No |
| 4. Counter Battens - 10mm residual cavity / *Correction roof protected by v | -1.64 | 496.5 | 532.9 | -2.81 | 0.00 | 0.00 | No |
| 5. *Correction roof protected by wind, e=0.31 / BoostR Hybrid | -1.44 | 496.5 | 541.9 | -2.81 | 0.00 | 0.00 | No |
| 6. BoostR Hybrid / OSB | 3.43 | 497.4 | 780.6 | -2.78 | 0.00 | 0.00 | No |
| 7. OSB / Hybris - Associated Air Gap / Rafter 150mm | 3.73 | 501.3 | 797.6 | -2.68 | 0.00 | 0.00 | No |
| 8. Hybris - Associated Air Gap / Rafter 150mm / Hybris / Rafter 150mm | 5.17 | 501.3 | 882.2 | -2.68 | 0.00 | 0.00 | No |
| 9. Hybris / Rafter 150mm / Hybris - Associated Air Gap / Rafter 150mm | 18.82 | 1 137.1 | 2 171.1 | 8.87 | 0.00 | 0.00 | No |
| 10. Hybris - Associated Air Gap / Rafter 150mm / Polythene, 500 gauge | 20.38 | 1 137.1 | 2 392.5 | 8.87 | 0.00 | 0.00 | No |
| 11. Polythene, 500 gauge / Plasterboard | 20.38 | 1 490.3 | 2 392.5 | 12.93 | 0.00 | 0.00 | No |
| 12. Plasterboard / Plaster, skim | 20.62 | 1 491.1 | 2 427.7 | 12.94 | 0.00 | 0.00 | No |
| 13. Plaster, skim / Internal surface | 20.64 | 1 491.3 | 2 431.1 | 12.94 | 0.00 | 0.00 | No |
| Internal surface | 21.00 | 1 491.3 | 2 431.1 | 12.94 | 0.00 | 0.00 | No |



**Interface temperature / Dew point graphical representation:**






Pitched roof @ 600c
U-value = 0.18 W/m²K

# UVALUE CALCULATION

**Users Ref:** 00 TECHNICAL EXERCISES **Issued on:** 31.July.2017

**Prop Type Ref:**

**Property:** **Carbon Index:** 0.0

**SAP Rating:** 0 **Fuel Bill:** £0.00 **CO2 Emissions:** 0.00 t/year

**Energy used:** 0.0 GJ per annum

Surveyor: ,
Address:
Client:

Software
SAP version: 0.00 Regs Region: England and Wales, Calculation Type: New Build
Calculation method: BS EN ISO 6946, BS EN ISO 13370, BS 5250

**Building Elements:**

**Building Element Roof TE1080 - r-tp HCH+H90@600c=0.18**

Roof Type: Pitched Roof, insulated sloping ceiling

| Layer | Description | Thickness | λ | R | Fraction |
|---|---|---|---|---|---|
| **External surface** | | | | 0.100 | |
| **Layer1** | **Tiling, concrete** | | | | |
| | Main construction | 15 mm | 1.500 | 0.000 | 100.00 % |
| **Layer2** | **Airspace/tile battens** | | | | |
| | Main construction | 25 mm | 0.156 | 0.000 | 87.33 % |
| | Corrections - Cavity Unventilated, Emissivity: Normal | | | | |
| | Bridging - Timber | 25 mm | 0.156 | 0.000 | 12.67 % |
| **Layer3** | **Airspace/counter battens** | | | | |
| | Main construction | 25 mm | 0.250 | 0.000 | 91.67 % |
| | Corrections - Cavity Ventilated, Emissivity: Normal | | | | |
| | Bridging - Timber | 25 mm | 0.130 | 0.000 | 8.33 % |
| **Layer4** | **Breather membrane** | | | | |
| | Main construction | 0 mm | 0.084 | 0.005 | 100.00 % |
| **Layer5** | **OSB** | | | | |
| | Main construction | 11 mm | 0.130 | 0.085 | 100.00 % |
| **Layer6** | **Hybris - Associated Air Gap / Rafter 125mm** | | | | |
| | Main construction | 13 mm | 0.032 | 0.407 | 92.17 % |
| | Bridging - Timber | 13 mm | 0.130 | 0.000 | 7.83 % |
| **Layer7** | **Hybris / Rafter 125mm** | | | | |
| | Main construction | 90 mm | 0.033 | 2.727 | 92.17 % |
| | Corrections - Air Gap: Level 0, Fasteners: None or plastic | | | | |
| | Bridging - Timber | 90 mm | 0.130 | 0.000 | 7.83 % |
| **Layer8** | **Hybris - Associated Air Gap / Rafter 125mm** | | | | |
| | Main construction | 13 mm | 0.027 | 0.474 | 92.17 % |
| | Bridging - Timber | 13 mm | 0.130 | 0.000 | 7.83 % |
| **Layer9** | **HControl Hybrid** | | | | |
| | Main construction | 45 mm | 0.024 | 1.900 | 93.67 % |
| | Bridging - Timber | 45 mm | 0.130 | 0.000 | 6.33 % |
| **Layer10** | **HControl Hybrid - Associated Air Gap / Batten 38mm** | | | | |
| | Main construction | 11 mm | 0.028 | 0.388 | 93.67 % |
| | Bridging - Timber | 11 mm | 0.130 | 0.000 | 6.33 % |
| **Layer11** | **Plasterboard** | | | | |
| | Main construction | 13 mm | 0.190 | 0.066 | 100.00 % |
| **Internal surface** | | | | 0.100 | |

**Total resistance:** Upper limit = 5.811 m²K/W Lower limit = 5.063 m²K/W Average = 5.437 m²K/W

U-value (unrounded) = 0.1839 W/m²K

# UVALUE CALCULATION

**Users Ref:** 00 TECHNICAL EXERCISES **Issued on:** 31.July.2017

**Prop Type Ref:**

**Property:** **Carbon Index:** 0.0

**SAP Rating:** 0 **Fuel Bill:** £0.00 **CO2 Emissions:** 0.00 t/year

**Energy used:** 0.0 GJ per annum

Surveyor: ,
Address:
Client:

Software
SAP version: 0.00 Regs Region: England and Wales, Calculation Type: New Build
Calculation method: BS EN ISO 6946, BS EN ISO 13370, BS 5250

**Building Elements:**

Unheated space: None

**Total thickness: 261 mm** **U-value: 0.18 W/m²K**

# CONDENSATION RISK ANALYSIS

**Users Ref:** 00 TECHNICAL EXERCISES **Issued on:** 31.July.2017

**Prop Type Ref:**

**Property:** **Carbon Index:** 0.0

**SAP Rating:** 0 **Fuel Bill:** £0.00 **CO2 Emissions:** 0.00 t/year

**Energy used:** 0.0 GJ per annum

Surveyor: ,
Address:
Client:

Software
SAP version: 0.00 Regs Region: England and Wales, Calculation Type: New Build
Calculation method: BS EN ISO 6946, BS EN ISO 13370, BS 5250

**Roof TE1080 - r-tp HCH+H90@600c=0.18**

**Environmental conditions:**

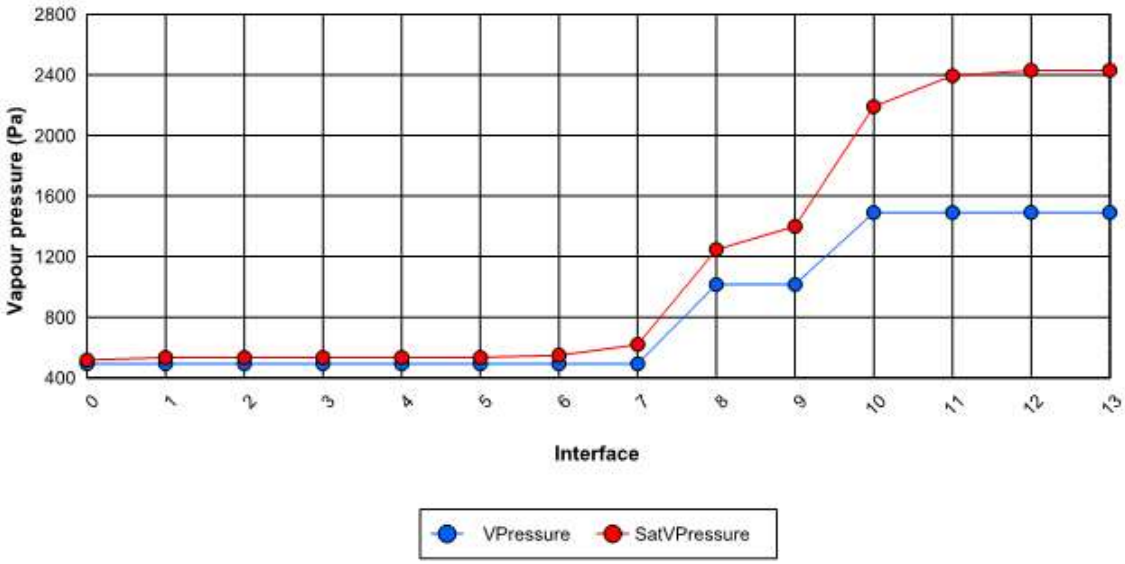
| | | |
|---|---|---|
| External conditions: | Temperature: -2 °C | Relative Humidity: 95 % |
| Internal conditions: | Temperature: 21 °C | Relative Humidity: 60 % |

**Table of layers:**

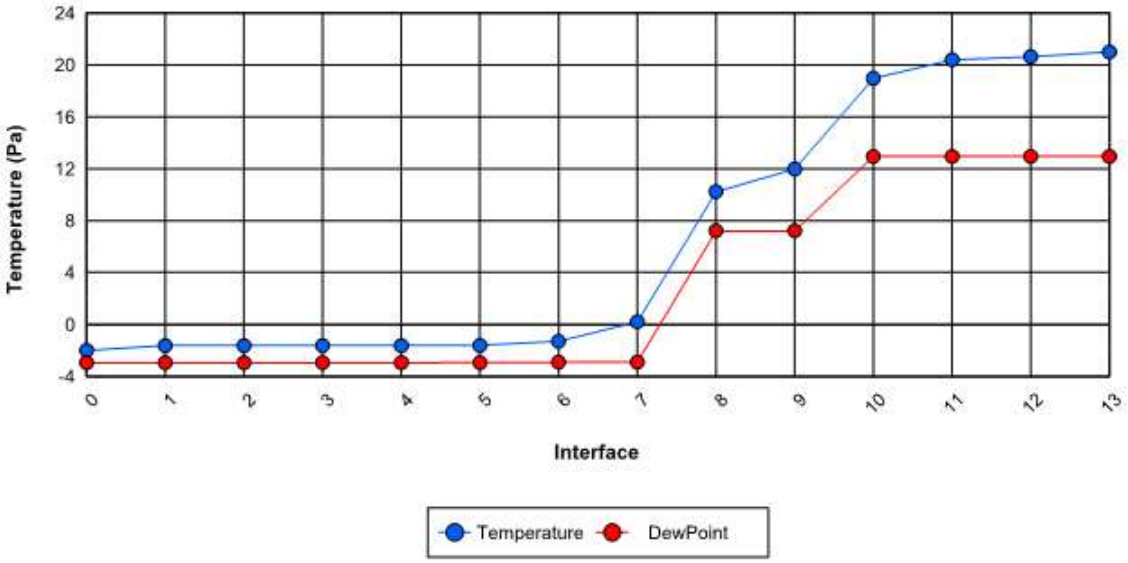
| Layer | Width mm | Thermal conduct. W/m.K | Thermal resistance m2.K/W | Cumulative thermal resistance m2.K/W | Vapour resistivity GN.s/kg.m | Vapour resistance GN.s/kg | Cumulative vapour resistance GN.s/kg |
|---|---|---|---|---|---|---|---|
| External surface | - | 0.000 | 0.100 | 0.100 | 0.000 | 0.000 | 0.00 |
| 1. Tiling, concrete | 15.0 | 1.500 | 0.000 | 0.100 | 0.000 | 0.000 | 0.00 |
| 2. Airspace/tile battens | 25.0 | 0.000 | 0.000 | 0.100 | 0.000 | 0.000 | 0.00 |
| 3. Airspace/counter battens | 25.0 | 0.000 | 0.000 | 0.100 | 0.000 | 0.000 | 0.00 |
| 4. Breather membrane | 0.4 | 0.084 | 0.005 | 0.105 | 0.000 | 0.40 | 0.40 |
| 5. OSB | 11.0 | 0.130 | 0.085 | 0.190 | 250.0 | 2.75 | 3.15 |
| 6. Hybris - Associated Air Gap / Rafter 125mm | 13.0 | 0.000 | 0.407 | 0.597 | 0.000 | 0.000 | 3.15 |
| 7. Hybris / Rafter 125mm | 90.0 | 0.033 | 2.727 | 3.324 | 0.000 | 1,100.00 | 1,103.15 |
| 8. Hybris - Associated Air Gap / Rafter 125mm | 13.0 | 0.000 | 0.474 | 3.798 | 0.000 | 0.000 | 1,103.15 |
| 9. HControl Hybrid | 45.0 | 0.000 | 1.900 | 5.698 | 0.000 | 1,000.00 | 2,103.15 |
| 10. HControl Hybrid - Associated Air Gap / Batte | 11.0 | 0.000 | 0.388 | 6.086 | 0.000 | 0.000 | 2,103.15 |
| 11. Plasterboard | 12.5 | 0.190 | 0.066 | 6.152 | 45.0 | 0.56 | 2,103.71 |
| Internal surface | - | 0.000 | 0.100 | 6.152 | 0.000 | 0.000 | 2,103.71 |

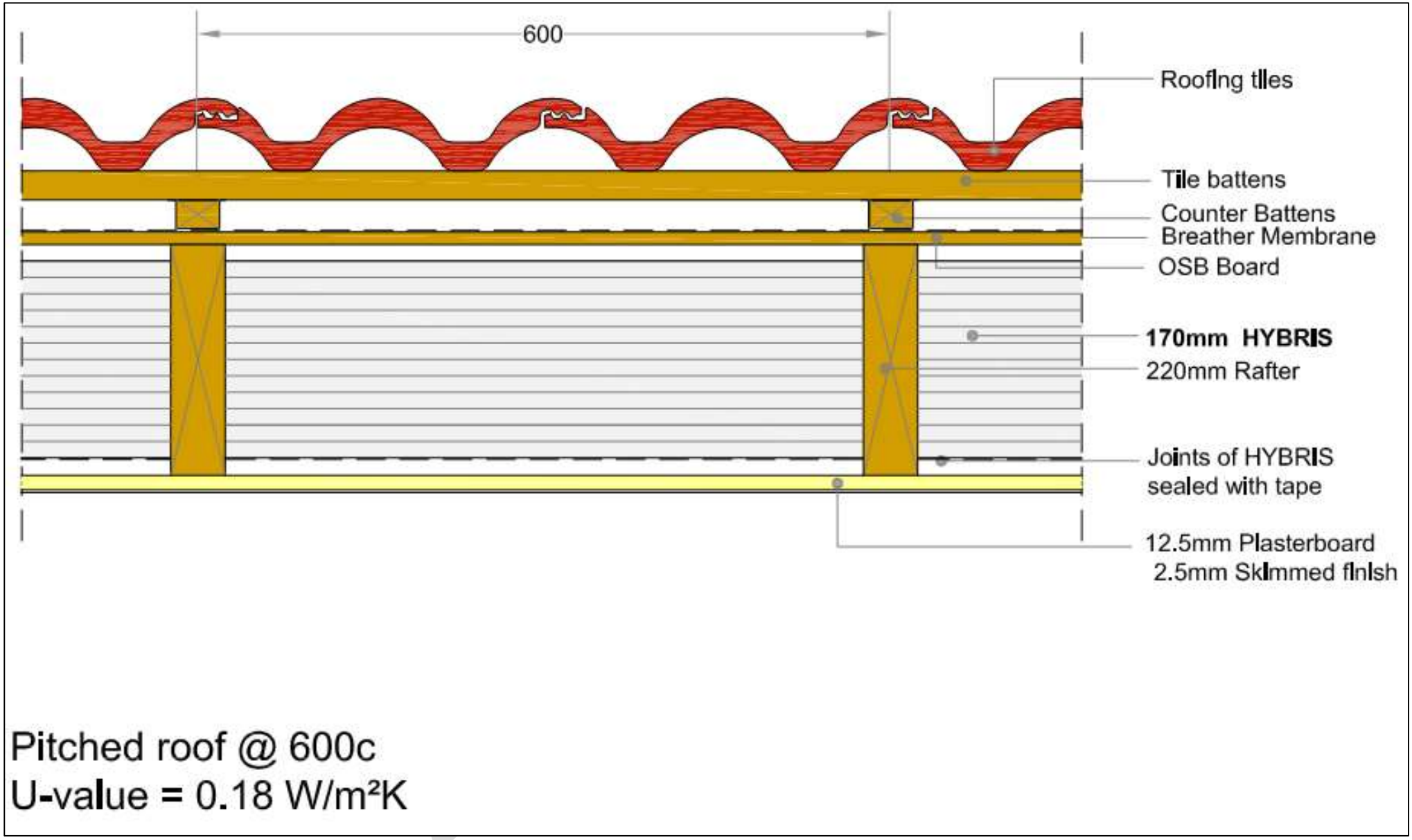
**Vapour pressure table:**

| Interface - between layers | Interface temp. °C | Vapour pressure Pa | Satur. vapour pressure Pa | Dew point °C | Cond. rate g/m2.h | Cond. rate 60 days g/m2.h | Cond. risk Y/N |
|---|---|---|---|---|---|---|---|
| External surface | -2.00 | 491.2 | 517.1 | -2.95 | 0.00 | 0.00 | No |
| 1. External surface / Tiling, concrete | -1.63 | 491.2 | 533.2 | -2.95 | 0.00 | 0.00 | No |
| 2. Tiling, concrete / Airspace/tile battens | -1.63 | 491.2 | 533.2 | -2.95 | 0.00 | 2.46 | No |
| 3. Airspace/tile battens / Airspace/counter battens | -1.63 | 491.2 | 533.2 | -2.95 | 0.00 | 2.46 | No |
| 4. Airspace/counter battens / Breather membrane | -1.63 | 491.2 | 533.2 | -2.95 | 0.00 | 2.46 | No |
| 5. Breather membrane / OSB | -1.61 | 491.4 | 534.1 | -2.94 | 0.00 | 0.00 | No |
| 6. OSB / Hybris - Associated Air Gap / Rafter 125mm | -1.30 | 492.7 | 548.1 | -2.91 | 0.00 | 0.00 | No |
| 7. Hybris - Associated Air Gap / Rafter 125mm / Hybris / Rafter 125mm | 0.19 | 492.7 | 619.2 | -2.91 | 0.00 | 0.00 | No |
| 8. Hybris / Rafter 125mm / Hybris - Associated Air Gap / Rafter 125mm | 10.23 | 1 015.7 | 1 246.2 | 7.21 | 0.00 | 0.00 | No |
| 9. Hybris - Associated Air Gap / Rafter 125mm / HControl Hybrid | 11.97 | 1 015.7 | 1 399.3 | 7.21 | 0.00 | 0.00 | No |
| 10. HControl Hybrid / HControl Hybrid - Associated Air Gap / Batten 38mm | 18.96 | 1 491.1 | 2 191.0 | 12.94 | 0.00 | 0.00 | No |
| 11. HControl Hybrid - Associated Air Gap / Batten 38mm / Plasterboard | 20.39 | 1 491.1 | 2 394.0 | 12.94 | 0.00 | 0.00 | No |
| 12. Plasterboard / Internal surface | 20.63 | 1 491.3 | 2 430.0 | 12.94 | 0.00 | 0.00 | No |
| Internal surface | 21.00 | 1 491.3 | 2 430.0 | 12.94 | 0.00 | 0.00 | No |



**Interface temperature / Dew point graphical representation:**






Pitched roof @ 600c

U-value = 0.18 W/m²K

# UVALUE CALCULATION

**Users Ref:** 00 TECHNICAL EXERCISES **Issued on:** 31.July.2017

**Prop Type Ref:**

**Property:** **Carbon Index:** 0.0

**SAP Rating:** 0 **Fuel Bill:** £0.00 **CO2 Emissions:** 0.00 t/year

**Energy used:** 0.0 GJ per annum

Surveyor: ,
Address:
Client:

Software
SAP version: 0.00 Regs Region: England and Wales, Calculation Type: New Build
Calculation method: BS EN ISO 6946, BS EN ISO 13370, BS 5250

**Building Elements:**

**Building Element Roof TE1081 - r-tp H170 @600c=0.18**

Roof Type: Pitched Roof, insulated sloping ceiling

| Layer | Description | Thickness | λ | R | Fraction |
|---|---|---|---|---|---|
| **External surface** | | | | 0.100 | |
| **Layer1** | **Tiling, concrete** | | | | |
| | Main construction | 15 mm | 1.500 | 0.000 | 100.00 % |
| **Layer2** | **Airspace/tile battens** | | | | |
| | Main construction | 25 mm | 0.156 | 0.000 | 87.33 % |
| | Corrections - Cavity Unventilated, Emissivity: Normal | | | | |
| | Bridging - Timber | 25 mm | 0.156 | 0.000 | 12.67 % |
| **Layer3** | **Airspace/counter battens** | | | | |
| | Main construction | 25 mm | 0.250 | 0.000 | 91.67 % |
| | Corrections - Cavity Ventilated, Emissivity: Normal | | | | |
| | Bridging - Timber | 25 mm | 0.130 | 0.000 | 8.33 % |
| **Layer4** | **Breather membrane** | | | | |
| | Main construction | 0 mm | 0.084 | 0.005 | 100.00 % |
| **Layer5** | **OSB** | | | | |
| | Main construction | 11 mm | 0.130 | 0.085 | 100.00 % |
| **Layer6** | **Hybris - Associated Air Gap / Rafter 200mm** | | | | |
| | Main construction | 15 mm | 0.037 | 0.407 | 92.17 % |
| | Bridging - Timber | 15 mm | 0.130 | 0.000 | 7.83 % |
| **Layer7** | **Hybris / Rafter 200mm** | | | | |
| | Main construction | 170 mm | 0.033 | 5.152 | 92.17 % |
| | Corrections - Air Gap: Level 0, Fasteners: None or plastic | | | | |
| | Bridging - Timber | 170 mm | 0.130 | 0.000 | 7.83 % |
| **Layer8** | **Hybris - Associated Air Gap / Rafter 200mm** | | | | |
| | Main construction | 15 mm | 0.034 | 0.443 | 92.17 % |
| | Bridging - Timber | 15 mm | 0.130 | 0.000 | 7.83 % |
| **Layer9** | **Polythene, 500 gauge** | | | | |
| | Main construction | 0 mm | 0.000 | 0.000 | 100.00 % |
| **Layer10** | **Plasterboard** | | | | |
| | Main construction | 13 mm | 0.190 | 0.066 | 100.00 % |
| **Internal surface** | | | | 0.100 | |

**Total resistance:** Upper limit = 5.618 m²K/W Lower limit = 5.245 m²K/W Average = 5.431 m²K/W
U-value (unrounded) = 0.1841 W/m²K

Unheated space: None

**Total thickness: 289 mm** **U-value: 0.18 W/m²K**

# CONDENSATION RISK ANALYSIS

**Users Ref:** 00 TECHNICAL EXERCISES **Issued on:** 31.July.2017

**Prop Type Ref:**

**Property:** **Carbon Index:** 0.0

**SAP Rating:** 0 **Fuel Bill:** £0.00 **CO2 Emissions:** 0.00 t/year

**Energy used:** 0.0 GJ per annum

Surveyor: ,
Address:
Client:

Software
SAP version: 0.00 Regs Region: England and Wales, Calculation Type: New Build
Calculation method: BS EN ISO 6946, BS EN ISO 13370, BS 5250

## Roof TE1081 - r-tp H170 @600c=0.18

**Environmental conditions:**

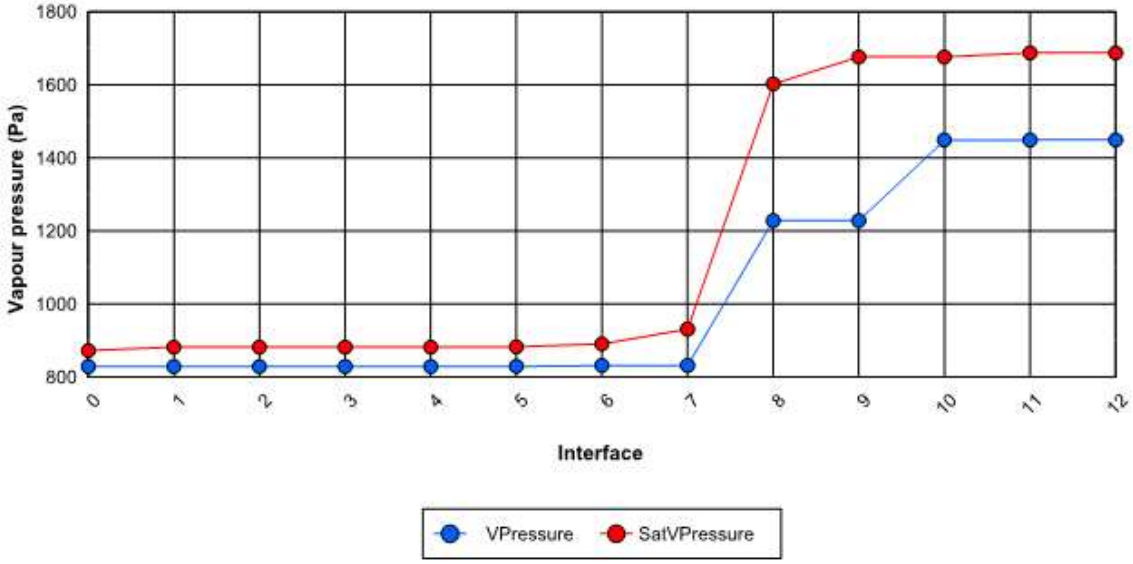
| | | |
|---|---|---|
| External conditions: | Temperature: 5 °C | Relative Humidity: 95 % |
| Internal conditions: | Temperature: 15 °C | Relative Humidity: 85 % |

**Table of layers:**

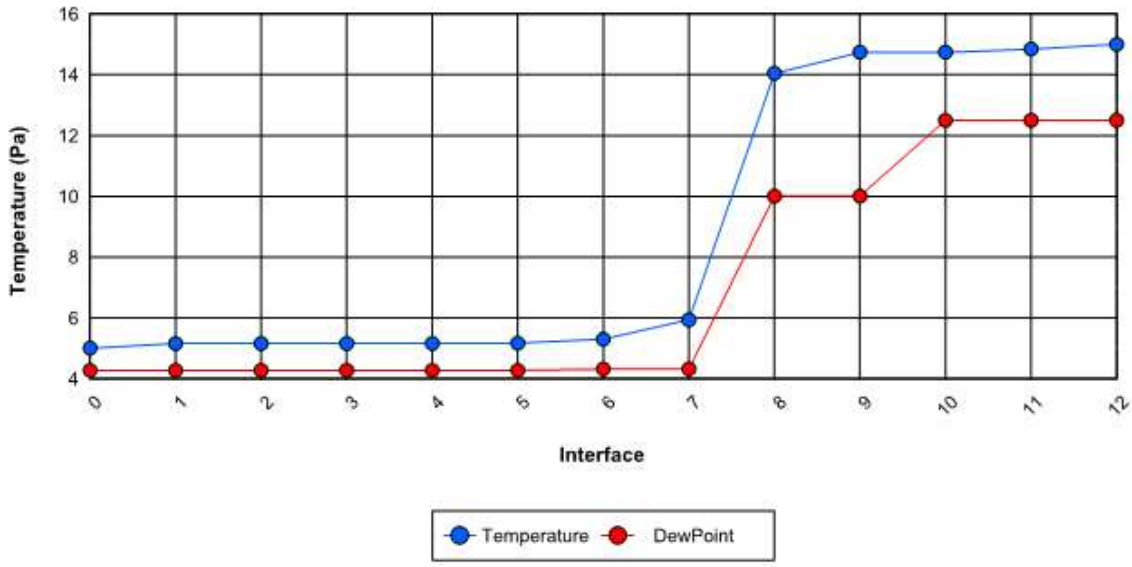
| Layer | Width mm | Thermal conduct. W/m.K | Thermal resistance m2.K/W | Cumulative thermal resistance m2.K/W | Vapour resistivity GN.s/kg.m | Vapour resistance GN.s/kg | Cumulative vapour resistance GN.s/kg |
|---|---|---|---|---|---|---|---|
| External surface | - | 0.000 | 0.100 | 0.100 | 0.000 | 0.000 | 0.00 |
| 1. Tiling, concrete | 15.0 | 1.500 | 0.000 | 0.100 | 0.000 | 0.000 | 0.00 |
| 2. Airspace/tile battens | 25.0 | 0.000 | 0.000 | 0.100 | 0.000 | 0.000 | 0.00 |
| 3. Airspace/counter battens | 25.0 | 0.000 | 0.000 | 0.100 | 0.000 | 0.000 | 0.00 |
| 4. Breather membrane | 0.4 | 0.084 | 0.005 | 0.105 | 0.000 | 0.40 | 0.40 |
| 5. OSB | 11.0 | 0.130 | 0.085 | 0.190 | 250.0 | 2.75 | 3.15 |
| 6. Hybris - Associated Air Gap / Rafter 200mm | 15.0 | 0.000 | 0.407 | 0.597 | 0.000 | 0.000 | 3.15 |
| 7. Hybris / Rafter 200mm | 170.0 | 0.033 | 5.152 | 5.748 | 0.000 | 450.00 | 453.15 |
| 8. Hybris - Associated Air Gap / Rafter 200mm | 15.0 | 0.000 | 0.443 | 6.191 | 0.000 | 0.000 | 453.15 |
| 9. Polythene, 500 gauge | 0.1 | 0.000 | 0.000 | 6.191 | 0.000 | 250.00 | 703.15 |
| 10. Plasterboard | 12.5 | 0.190 | 0.066 | 6.257 | 45.0 | 0.56 | 703.71 |
| Internal surface | - | 0.000 | 0.100 | 6.257 | 0.000 | 0.000 | 703.71 |

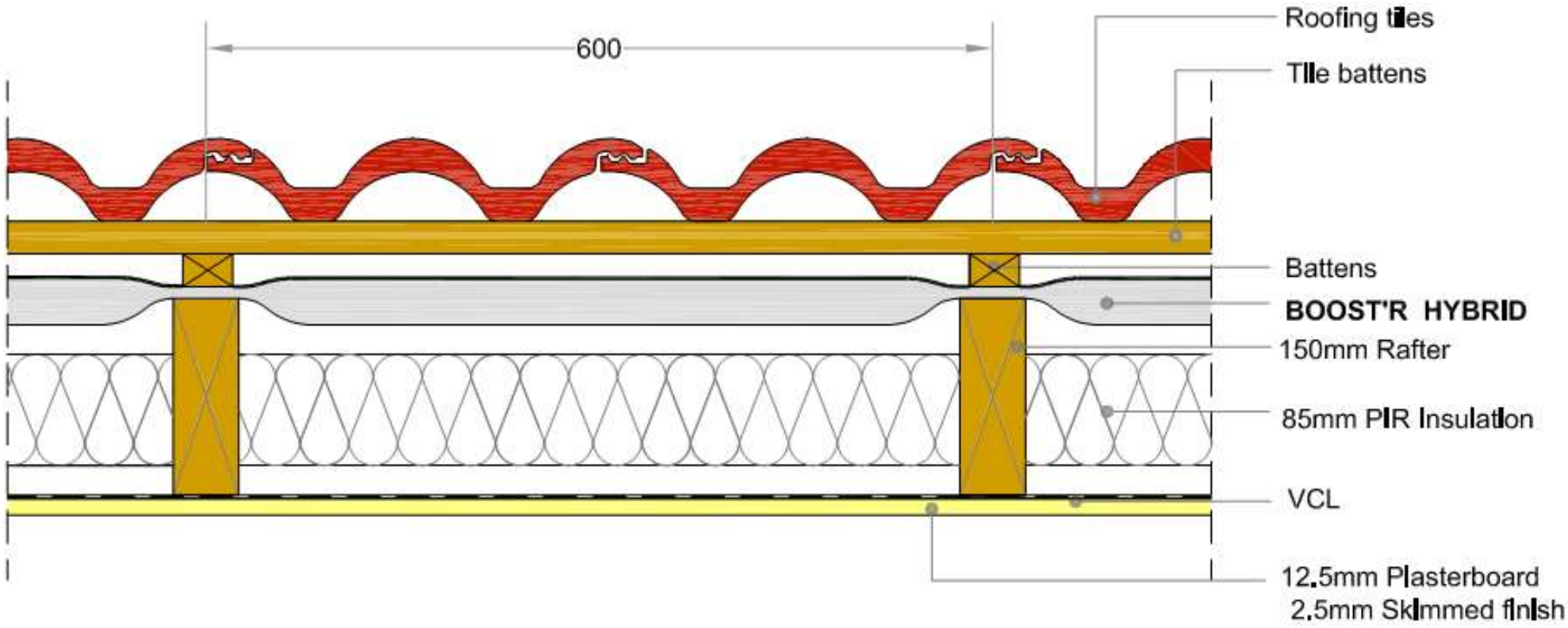
**Vapour pressure table:**

| Interface - between layers | Interface temp. °C | Vapour pressure Pa | Satur. vapour pressure Pa | Dew point °C | Cond. rate g/m2.h | Cond. rate 60 days g/m2.h | Cond. risk Y/N |
|---|---|---|---|---|---|---|---|
| External surface | 5.00 | 828.3 | 871.9 | 4.27 | 0.00 | 0.00 | No |
| 1. External surface / Tiling, concrete | 5.16 | 828.3 | 881.5 | 4.27 | 0.00 | 0.00 | No |
| 2. Tiling, concrete / Airspace/tile battens | 5.16 | 828.3 | 881.5 | 4.27 | 0.00 | 4.57 | No |
| 3. Airspace/tile battens / Airspace/counter battens | 5.16 | 828.3 | 881.5 | 4.27 | 0.00 | 4.57 | No |
| 4. Airspace/counter battens / Breather membrane | 5.16 | 828.3 | 881.5 | 4.27 | 0.00 | 4.57 | No |
| 5. Breather membrane / OSB | 5.17 | 828.6 | 882.0 | 4.27 | 0.00 | 0.00 | No |
| 6. OSB / Hybris - Associated Air Gap / Rafter 200mm | 5.30 | 831.0 | 890.2 | 4.32 | 0.00 | 0.00 | No |
| 7. Hybris - Associated Air Gap / Rafter 200mm / Hybris / Rafter 200mm | 5.94 | 831.0 | 930.7 | 4.32 | 0.00 | 0.00 | No |
| 8. Hybris / Rafter 200mm / Hybris - Associated Air Gap / Rafter 200mm | 14.04 | 1 227.8 | 1 602.1 | 10.01 | 0.00 | 0.00 | No |
| 9. Hybris - Associated Air Gap / Rafter 200mm / Polythene, 500 gauge | 14.74 | 1 227.8 | 1 676.0 | 10.01 | 0.00 | 0.00 | No |
| 10. Polythene, 500 gauge / Plasterboard | 14.74 | 1 448.3 | 1 676.0 | 12.50 | 0.00 | 0.00 | No |
| 11. Plasterboard / Internal surface | 14.84 | 1 448.7 | 1 687.2 | 12.50 | 0.00 | 0.00 | No |
| Internal surface | 15.00 | 1 448.7 | 1 687.2 | 12.50 | 0.00 | 0.00 | No |



**Interface temperature / Dew point graphical representation:**






PF42:
Pitched roof @ 600c
U-value = 0.18 W/m²K

# UVALUE CALCULATION

**Users Ref:** 00 PATHFINDER 2014-09 **Issued on:** 15.September.2014

**Prop Type Ref:**

**Property:** **Carbon Index:** 0.0

**SAP Rating:** 0 **Fuel Bill:** £0.00 **CO2 Emissions:** 0.00 t/year

**Energy used:** 0.0 GJ per annum

Surveyor: ,
Address:
Client:

Software
SAP version: 0.00 Regs Region: England and Wales, Calculation Type: New Build
Calculation method: BS EN ISO 6946, BS EN ISO 13370, BS 5250

**Building Elements:**

**Building Element Roof PF42 - r-tp 85PIR+BRH @600c=0.18**

Roof Type: Pitched Roof, insulated sloping ceiling

| Layer | Description | Thickness | λ | R | Fraction |
|---|---|---|---|---|---|
| **External surface** | | | | 0.100 | |
| **Layer1** | **Tiling, clay** | | | | |
| | Main construction | 15 mm | 1.000 | 0.000 | 100.00 % |
| **Layer2** | **Standard cavity / tile battens** | | | | |
| | Main construction | 25 mm | 0.250 | 0.000 | 87.33 % |
| | Corrections - Cavity Ventilated, Emissivity: Normal | | | | |
| | Bridging - Timber | 25 mm | 0.130 | 0.000 | 12.67 % |
| **Layer3** | **Air Gap Roof protected by wind, Emissivity: 0.31** | | | | |
| | Main construction | 25 mm | 0.446 | 0.056 | 100.00 % |
| **Layer4** | **BoostR Hybrid** | | | | |
| | Main construction | 35 mm | 0.026 | 1.350 | 93.67 % |
| | Bridging - Timber | 35 mm | 0.130 | 0.000 | 6.33 % |
| **Layer5** | **Non ventilated air layer - low e / Rafter 140mm** | | | | |
| | Main construction | 15 mm | 0.031 | 0.480 | 92.17 % |
| | Bridging - Timber | 15 mm | 0.130 | 0.000 | 7.83 % |
| **Layer6** | **PIR / Rafter 140mm** | | | | |
| | Main construction | 85 mm | 0.022 | 3.864 | 92.17 % |
| | Corrections - Air Gap: Level 0, Fasteners: None or plastic | | | | |
| | Bridging - Timber | 85 mm | 0.130 | 0.000 | 7.83 % |
| **Layer7** | **Non ventilated air layer - low e** | | | | |
| | Main construction | 15 mm | 0.033 | 0.453 | 92.17 % |
| | Bridging - Timber | 15 mm | 0.130 | 0.000 | 7.83 % |
| **Layer8** | **Vapour Control Layer** | | | | |
| | Main construction | 0 mm | 0.500 | 0.001 | 100.00 % |
| **Layer9** | **Plasterboard, skimmed finish** | | | | |
| | Main construction | 15 mm | 0.190 | 0.079 | 100.00 % |
| **Internal surface** | | | | 0.100 | |

**Total resistance:** Upper limit = 5.866 m²K/W Lower limit = 4.957 m²K/W Average = 5.411 m²K/W

U-value (unrounded) = 0.1848 W/m²K

Unheated space: None

**Total thickness: 230 mm** **U-value: 0.18 W/m²K**

# CONDENSATION RISK ANALYSIS

**Users Ref:** 00 PATHFINDER 2014-09 **Issued on:** 15.September.2014

**Prop Type Ref:**

**Property:** **Carbon Index:** 0.0

**SAP Rating:** 0 **Fuel Bill:** £0.00 **CO2 Emissions:** 0.00 t/year

**Energy used:** 0.0 GJ per annum

Surveyor: ,
Address:
Client:

Software
SAP version: 0.00 Regs Region: England and Wales, Calculation Type: New Build
Calculation method: BS EN ISO 6946, BS EN ISO 13370, BS 5250

## Roof PF42 - r-tp 85PIR+BRH @600c=0.18

### Environmental conditions:

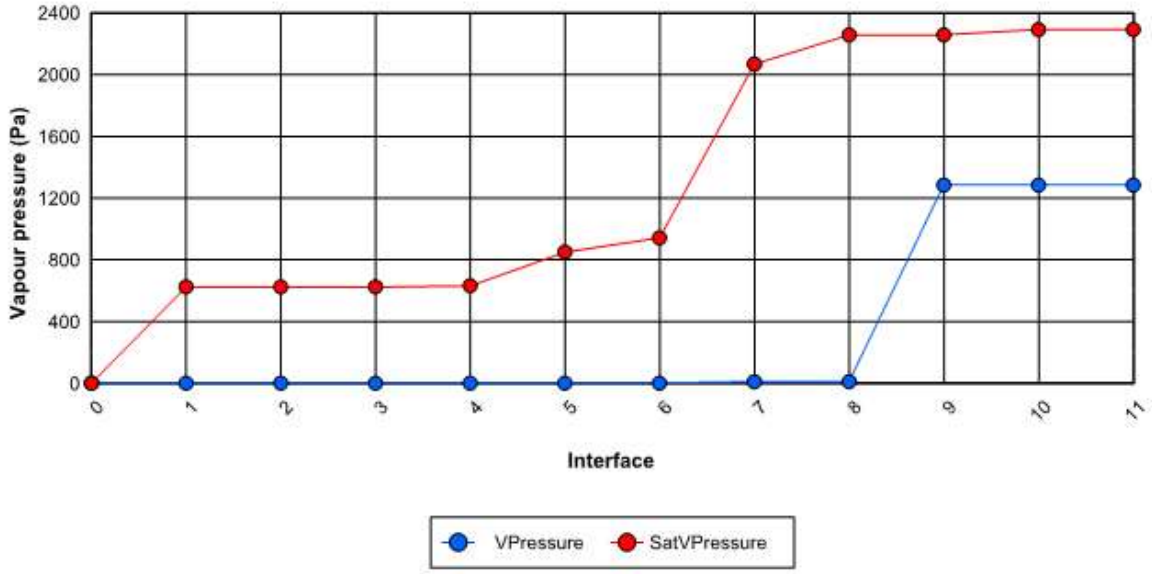
| | | |
|---|---|---|
| External conditions: | Temperature: 0 °C | Relative Humidity: 95 % |
| Internal conditions: | Temperature: 20 °C | Relative Humidity: 55 % |

### Table of layers:

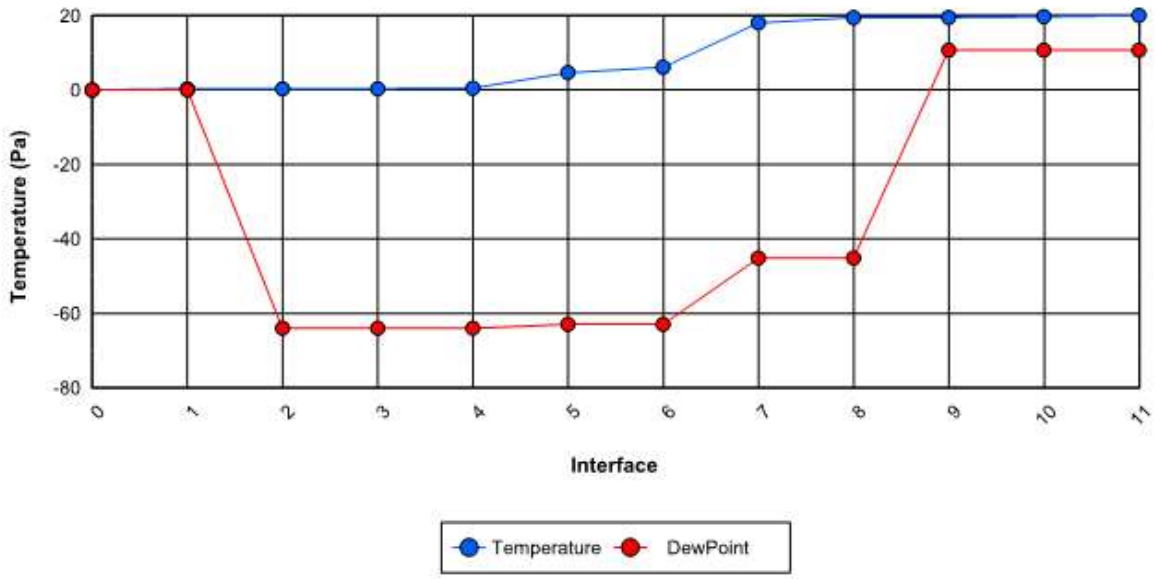
| Layer | Width mm | Thermal conduct. W/m.K | Thermal resistance m2.K/W | Cumulative thermal resistance m2.K/W | Vapour resistivity GN.s/kg.m | Vapour resistance GN.s/kg | Cumulative vapour resistance GN.s/kg |
|---|---|---|---|---|---|---|---|
| External surface | - | 0.000 | 0.100 | 0.100 | 0.000 | 0.000 | 0.00 |
| 1. Tiling, clay | 15.0 | 1.000 | 0.000 | 0.100 | 250.0 | 3.75 | 3.75 |
| 2. Standard cavity / tile battens | 25.0 | 0.000 | 0.000 | 0.100 | 0.000 | 0.000 | 3.75 |
| 3. Air Gap Roof protected by wind, Emissivity: 0 | 25.0 | 0.000 | 0.056 | 0.156 | 0.000 | 0.000 | 3.75 |
| 4. BoostR Hybrid | 35.0 | 0.000 | 1.350 | 1.506 | 0.000 | 0.60 | 4.35 |
| 5. Non ventilated air layer - low e / Rafter 140mm | 15.0 | 0.000 | 0.480 | 1.986 | 0.000 | 0.000 | 4.35 |
| 6. PIR / Rafter 140mm | 85.0 | 0.022 | 3.864 | 5.850 | 400.0 | 34.00 | 38.35 |
| 7. Non ventilated air layer - low e | 15.0 | 0.000 | 0.453 | 6.303 | 0.000 | 0.000 | 38.35 |
| 8. Vapour Control Layer | 0.4 | 0.500 | 0.001 | 6.303 | 0.000 | 4,650.00 | 4,688.35 |
| 9. Plasterboard, skimmed finish | 15.0 | 0.190 | 0.079 | 6.382 | 45.0 | 0.68 | 4,689.03 |
| Internal surface | - | 0.000 | 0.100 | 6.382 | 0.000 | 0.000 | 4,689.03 |

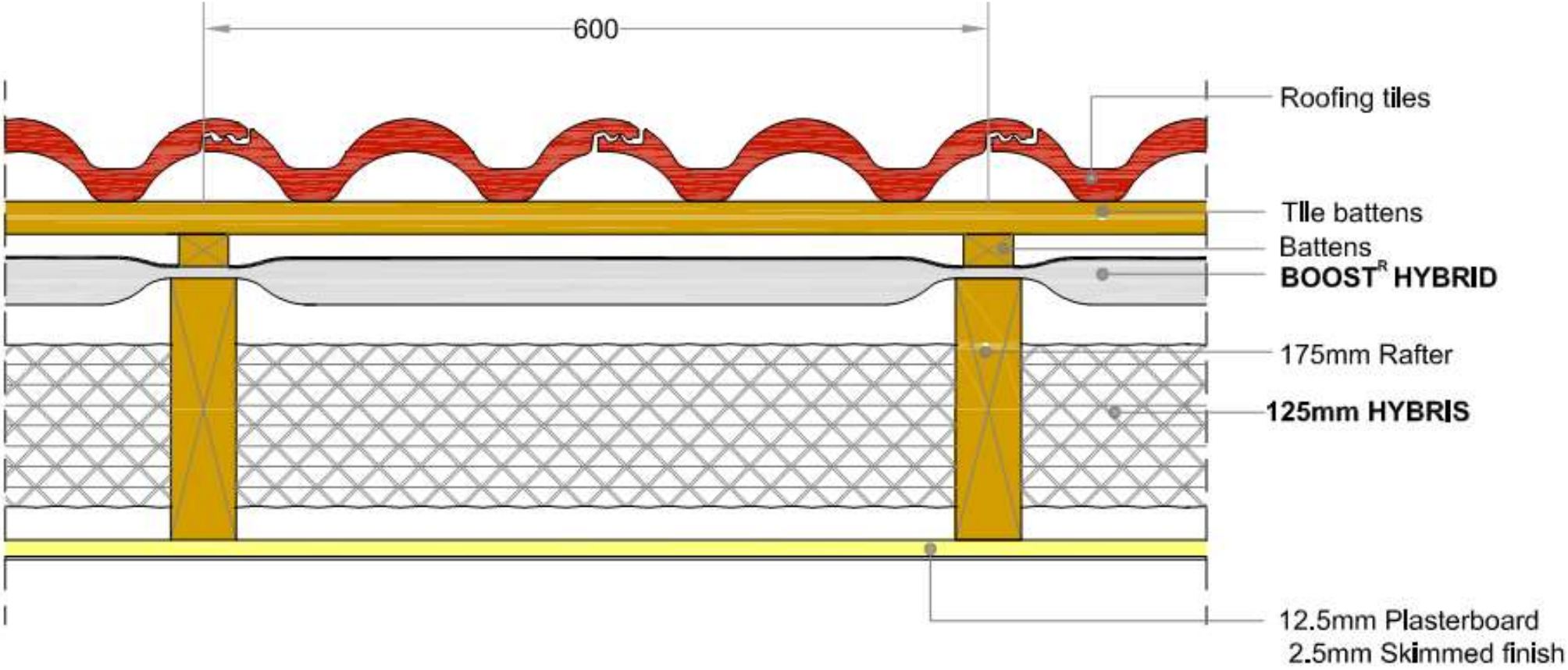
**Vapour pressure table:**

| Interface - between layers | Interface temp. °C | Vapour pressure Pa | Satur. vapour pressure Pa | Dew point °C | Cond. rate g/m2.h | Cond. rate 60 days g/m2.h | Cond. risk Y/N |
|---|---|---|---|---|---|---|---|
| External surface | 0.00 | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 | No |
| 1. External surface / Tiling, clay | 0.31 | 0.0 | 624.3 | 0.00 | 0.00 | 0.00 | No |
| 2. Tiling, clay / Standard cavity / tile battens | 0.31 | 1.0 | 624.3 | -64.07 | 0.00 | 0.00 | No |
| 3. Standard cavity / tile battens / Air Gap Roof protected by wind, Emissivit | 0.31 | 1.0 | 624.3 | -64.07 | 0.00 | 0.00 | No |
| 4. Air Gap Roof protected by wind, Emissivity: 0.31 / BoostR Hybrid | 0.48 | 1.0 | 632.2 | -64.07 | 0.00 | 0.00 | No |
| 5. BoostR Hybrid / Non ventilated air layer - low e / Rafter 140mm | 4.65 | 1.2 | 850.6 | -62.97 | 0.00 | 0.00 | No |
| 6. Non ventilated air layer - low e / Rafter 140mm / PIR / Rafter 140mm | 6.13 | 1.2 | 942.9 | -62.97 | 0.00 | 0.00 | No |
| 7. PIR / Rafter 140mm / Non ventilated air layer - low e | 18.05 | 10.5 | 2 069.0 | -45.19 | 0.00 | 0.00 | No |
| 8. Non ventilated air layer - low e / Vapour Control Layer | 19.45 | 10.5 | 2 257.9 | -45.19 | 0.00 | 0.00 | No |
| 9. Vapour Control Layer / Plasterboard, skimmed finish | 19.45 | 1 285.1 | 2 258.3 | 10.69 | 0.00 | 0.00 | No |
| 10. Plasterboard, skimmed finish / Internal surface | 19.69 | 1 285.3 | 2 292.7 | 10.69 | 0.00 | 0.00 | No |
| Internal surface | 20.00 | 1 285.3 | 2 292.7 | 10.69 | 0.00 | 0.00 | No |



**Interface temperature / Dew point graphical representation:**






PF53b:
Pitched roof @ 600c
U-value = 0.18 W/m²K

# UVALUE CALCULATION

**Users Ref:** 00 PATHFINDER 2017 **Issued on:** 29.September.2017

**Prop Type Ref:**

**Property:** **Carbon Index:** 0.0

**SAP Rating:** 0 **Fuel Bill:** £0.00 **CO2 Emissions:** 0.00 t/year

**Energy used:** 0.0 GJ per annum

Surveyor: ,
Address:
Client:

Software
SAP version: 0.00 Regs Region: England and Wales, Calculation Type: New Build
Calculation method: BS EN ISO 6946, BS EN ISO 13370, BS 5250

**Building Elements:**

**Building Element Roof PF53b - r-tp 125H+BRH @600c =0.18**

Roof Type: Pitched Roof, insulated sloping ceiling

| Layer | Description | Thickness | λ | R | Fraction |
|---|---|---|---|---|---|
| **External surface** | | | | 0.100 | |
| **Layer1** | **Tiling, clay** | | | | |
| | Main construction | 15 mm | 1.000 | 0.000 | 100.00 % |
| **Layer2** | **air gap / Battens** | | | | |
| | Main construction | 25 mm | 0.220 | 0.000 | 89.63 % |
| | Corrections - Cavity Ventilated, Emissivity: Normal | | | | |
| | Bridging - Timber | 25 mm | 0.138 | 0.000 | 10.37 % |
| **Layer3** | ***Correction roof protected by wind, e=0.31** | | | | |
| | Main construction | 25 mm | 0.446 | 0.056 | 100.00 % |
| **Layer4** | **BoostR Hybrid** | | | | |
| | Main construction | 35 mm | 0.026 | 1.350 | 92.17 % |
| | Bridging - Timber | 35 mm | 0.130 | 0.000 | 7.83 % |
| **Layer5** | **Hybris - Associated Air Gap / Rafter 175mm** | | | | |
| | Main construction | 15 mm | 0.031 | 0.470 | 92.17 % |
| | Bridging - Timber | 15 mm | 0.130 | 0.000 | 7.83 % |
| **Layer6** | **Hybris / Rafter 175mm** | | | | |
| | Main construction | 125 mm | 0.033 | 0.000 | 92.17 % |
| | Corrections - Air Gap: Level 0, Fasteners: None or plastic | | | | |
| | Bridging - Timber | 125 mm | 0.130 | 3.788 | 7.83 % |
| **Layer7** | **Hybris - Associated Air Gap / Rafter 175mm** | | | | |
| | Main construction | 15 mm | 0.033 | 0.443 | 92.17 % |
| | Bridging - Timber | 15 mm | 0.130 | 0.000 | 7.83 % |
| **Layer8** | **Plasterboard** | | | | |
| | Main construction | 13 mm | 0.190 | 0.066 | 100.00 % |
| **Internal surface** | | | | 0.100 | |

**Total resistance:** Upper limit = 5.829 m²K/W Lower limit = 5.163 m²K/W Average = 5.496 m²K/W

U-value (unrounded) = 0.1819 W/m²K

Unheated space: None

**Total thickness: 267 mm** **U-value: 0.18 W/m²K**

# CONDENSATION RISK ANALYSIS

**Users Ref:** 00 PATHFINDER 2017 **Issued on:** 29.September.2017

**Prop Type Ref:**

**Property:** **Carbon Index:** 0.0

**SAP Rating:** 0 **Fuel Bill:** £0.00 **CO2 Emissions:** 0.00 t/year

**Energy used:** 0.0 GJ per annum

Surveyor: ,
Address:
Client:

Software
SAP version: 0.00 Regs Region: England and Wales, Calculation Type: New Build
Calculation method: BS EN ISO 6946, BS EN ISO 13370, BS 5250

## Roof PF53b - r-tp 125H+BRH @600c =0.18

### Environmental conditions:

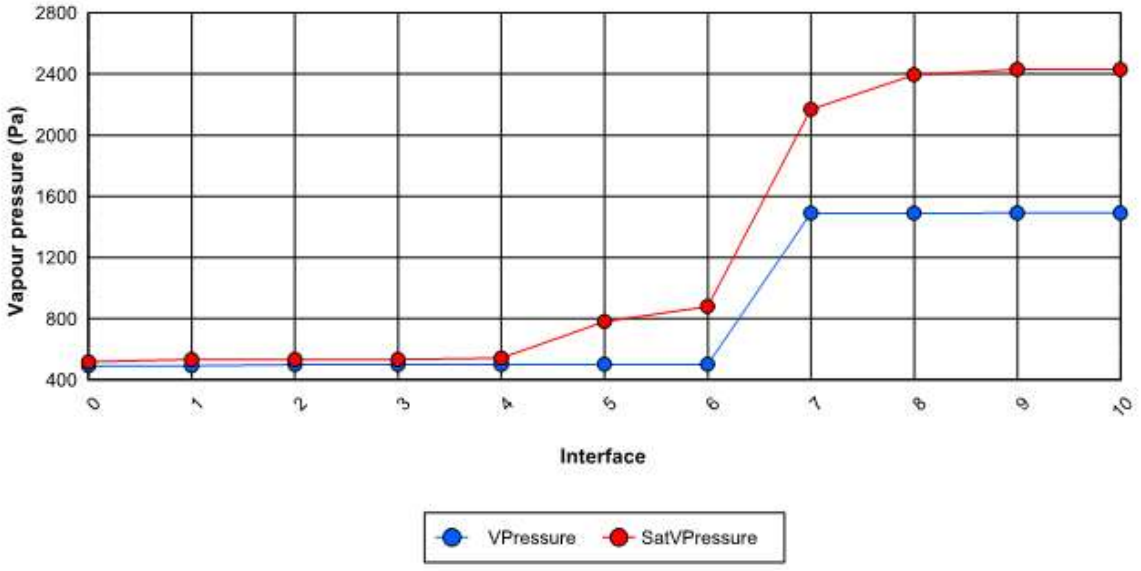
| | | |
|---|---|---|
| External conditions: | Temperature: -2 °C | Relative Humidity: 95 % |
| Internal conditions: | Temperature: 21 °C | Relative Humidity: 60 % |

### Table of layers:

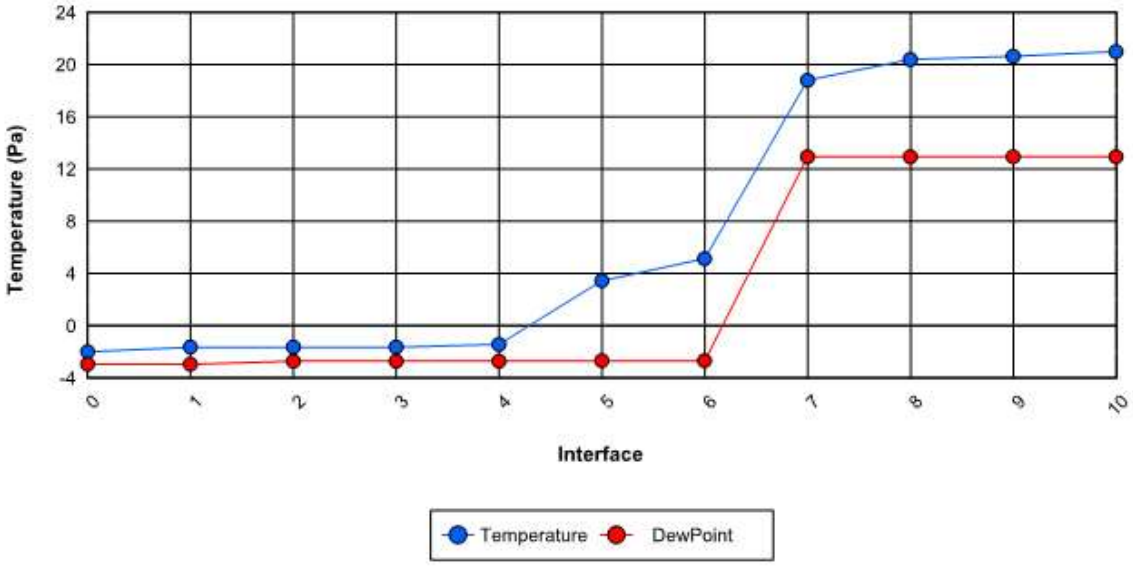
| Layer | Width mm | Thermal conduct. W/m.K | Thermal resistance m2.K/W | Cumulative thermal resistance m2.K/W | Vapour resistivity GN.s/kg.m | Vapour resistance GN.s/kg | Cumulative vapour resistance GN.s/kg |
|---|---|---|---|---|---|---|---|
| External surface | - | 0.000 | 0.100 | 0.100 | 0.000 | 0.000 | 0.00 |
| 1. Tiling, clay | 15.0 | 1.000 | 0.000 | 0.100 | 250.0 | 3.75 | 3.75 |
| 2. air gap / Battens | 25.0 | 0.220 | 0.000 | 0.100 | 0.000 | 0.000 | 3.75 |
| 3. *Correction roof protected by wind, e=0.31 | 25.0 | 0.000 | 0.056 | 0.156 | 0.000 | 0.000 | 3.75 |
| 4. BoostR Hybrid | 35.0 | 0.000 | 1.350 | 1.506 | 0.000 | 0.60 | 4.35 |
| 5. Hybris - Associated Air Gap / Rafter 175mm | 14.5 | 0.000 | 0.470 | 1.976 | 0.000 | 0.000 | 4.35 |
| 6. Hybris / Rafter 175mm | 125.0 | 0.033 | 3.788 | 5.764 | 0.000 | 450.00 | 454.35 |
| 7. Hybris - Associated Air Gap / Rafter 175mm | 14.5 | 0.000 | 0.443 | 6.207 | 0.000 | 0.000 | 454.35 |
| 8. Plasterboard | 12.5 | 0.190 | 0.066 | 6.273 | 45.0 | 0.56 | 454.91 |
| Internal surface | - | 0.000 | 0.100 | 6.273 | 0.000 | 0.000 | 454.91 |

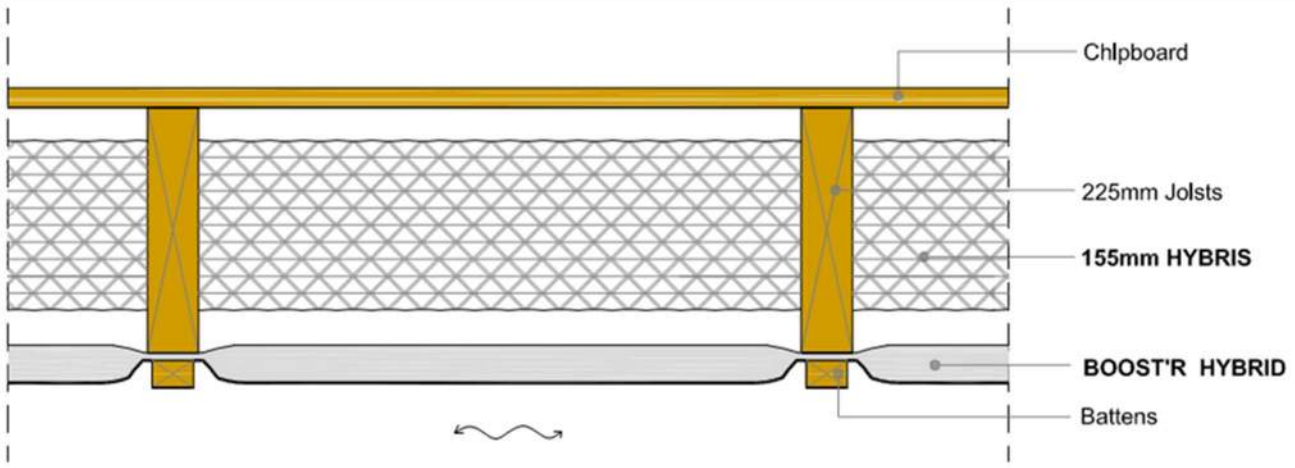
**Vapour pressure table:**

| Interface - between layers | Interface temp. °C | Vapour pressure Pa | Satur. vapour pressure Pa | Dew point °C | Cond. rate g/m2.h | Cond. rate 60 days g/m2.h | Cond. risk Y/N |
|---|---|---|---|---|---|---|---|
| External surface | -2.00 | 491.2 | 517.1 | -2.95 | 0.00 | 0.00 | No |
| 1. External surface / Tiling, clay | -1.64 | 491.2 | 532.9 | -2.95 | 0.00 | 0.00 | No |
| 2. Tiling, clay / air gap / Battens | -1.64 | 499.5 | 532.9 | -2.73 | 0.00 | 0.00 | No |
| 3. air gap / Battens / *Correction roof protected by wind, e=0.31 | -1.64 | 499.5 | 532.9 | -2.73 | 0.00 | 0.00 | No |
| 4. *Correction roof protected by wind, e=0.31 / BoostR Hybrid | -1.44 | 499.5 | 542.0 | -2.73 | 0.00 | 0.00 | No |
| 5. BoostR Hybrid / Hybris - Associated Air Gap / Rafter 175mm | 3.44 | 500.8 | 781.1 | -2.69 | 0.00 | 0.00 | No |
| 6. Hybris - Associated Air Gap / Rafter 175mm / Hybris / Rafter 175mm | 5.13 | 500.8 | 879.9 | -2.69 | 0.00 | 0.00 | No |
| 7. Hybris / Rafter 175mm / Hybris - Associated Air Gap / Rafter 175mm | 18.80 | 1 490.1 | 2 169.3 | 12.93 | 0.00 | 0.00 | No |
| 8. Hybris - Associated Air Gap / Rafter 175mm / Plasterboard | 20.40 | 1 490.1 | 2 395.7 | 12.93 | 0.00 | 0.00 | No |
| 9. Plasterboard / Internal surface | 20.64 | 1 491.3 | 2 431.0 | 12.94 | 0.00 | 0.00 | No |
| Internal surface | 21.00 | 1 491.3 | 2 431.0 | 12.94 | 0.00 | 0.00 | No |



**Interface temperature / Dew point graphical representation:**






PF139:
Suspended Timber Floor
U-value = 0.13 W/m²K

# U-VALUE CALCULATOR REPORT

Design SAP
elmhurst energy

| | | | |
|---|---|---|---|
| Property Reference | - PATHFINDER 2018 | Issued on Date | 09/01/2019 |
| Assessment Reference | | Prop Type Ref | |
| Project | | | |
| Calculation Type | New Build (As Built) | | |

| | | | | | |
|---|---|---|---|---|---|
| SAP Rating | | DER | | TER | |
| Environmental | | % DER<TER | | | |
| $CO_2$ Emissions (t/year) | | DFEE | | TFEE | |
| General Requirements Compliance | | % DFEE<TFEE | | | |

| | | | |
|---|---|---|---|
| Assessor Details | Mr. Thomas Wiedmer, Thomas Wiedmer, Tel: 01249 462888, thomas.wiedmer@insulation-actis.com | Assessor ID | T436-0001 |
| Client | | | |

## Building Elements

### Floor PF139 - f-ts 155h+brh @400c = 0.13

Floor Type: Suspended Floor
Area = 85.90 m², Perimeter = 42.95 m, Wall thickness = 257.00 mm, Soil: Unknown
Depth of underfloor space below ground:0.300 m  Floor wind shielding: Average (suburban)
Floor height above ground:h = 0.225 m
U-value of walls above ground:Uw = 0.160 m
Ventilation openings per perimeter length:e = 0.0015 %
Mean wind speed:v = 5.000 m/s
Resistance on solum:Rg = 0.000 m²K/W

| Layer | Description | Thickness (mm) | Conductivity (W/m²K) | Resistance (m²K/W) | Fraction (%) |
|---|---|---|---|---|---|
| Ext surface | | | | 0.1700 | |
| Layer 1 | **Boost'R Hybrid / Battens** | | | | |
| | Main construction | 35 | 0.0259 | 1.3500 | 90.50 |
| | Main construction | 35 | 0.1300 | 0.2692 | 9.50 |
| Layer 2 | **Hybris - Associated Air Gap / Joists** | | | | |
| | Main construction | 31.5 | 0.0306 | 1.0300 | 88.25 |
| | Main construction | 31.5 | 0.1300 | 0.2423 | 11.75 |
| Layer 3 | **Hybris / Joists** | | | | |
| | Main construction | 155 | 0.0330 | 4.6970 | 88.25 |
| | Main construction | 155 | 0.1300 | 1.1923 | 11.75 |
| | Corrections - Air Gap: Level 1, Fasteners: None or plastic | | | | |
| Layer 4 | **Hybris - Associated Air Gap / Joists** | | | | |
| | Main construction | 31.5 | 0.0347 | 0.9090 | 88.25 |
| | Main construction | 31.5 | 0.1300 | 0.2423 | 11.75 |
| Layer 5 | **Polythene, 500 gauge** | | | | |
| | Main construction | 0.25 | 0.0000 | 0.0000 | 100.00 |
| Layer 6 | **Chipboard** | | | | |
| | Main construction | 18 | 0.1300 | 0.1385 | 100.00 |
| Int surface | | | | 0.1700 | |

Total resistance: Upper limit = 7.492 m² K/W  Lower limit = 6.379 m² K/W  Average = 6.935 m² K/W
Total correction = 0.0025 m² K/W  U-value (unrounded) = 0.13 W/m² K

Unheated space: None

Total thickness: 271 mm  U-value: 0.13 W/m² K  Kappa: n/a

# CONDENSATION RISK ANALYSIS

Design SAP
elmhurst energy

| | | | |
|---|---|---|---|
| Property Reference | - PATHFINDER 2018 | Issued on Date | 09/01/2019 |
| Assessment Reference | | Prop Type Ref | |
| Project | | | |
| Calculation Type | New Build (As Built) | | |

| | | | | | |
|---|---|---|---|---|---|
| SAP Rating | | DER | | TER | |
| Environmental | | % DER<TER | | | |
| $CO_2$ Emissions (t/year) | | DFEE | | TFEE | |
| General Requirements Compliance | | % DFEE<TFEE | | | |

| | | | |
|---|---|---|---|
| Assessor Details | Mr. Thomas Wiedmer, Thomas Wiedmer, Tel: 01249 462888, thomas.wiedmer@insulation-actis.com | Assessor ID | T436-0001 |
| Client | | | |

## Floor - PF139

### Environmental conditions

| | | | | | |
|---|---|---|---|---|---|
| External conditions | Temperature: | 5 | °C | Relative Humidity: | 95 % |
| Internal conditions | Temperature: | 15 | °C | Relative Humidity: | 65 % |

### Table of layers

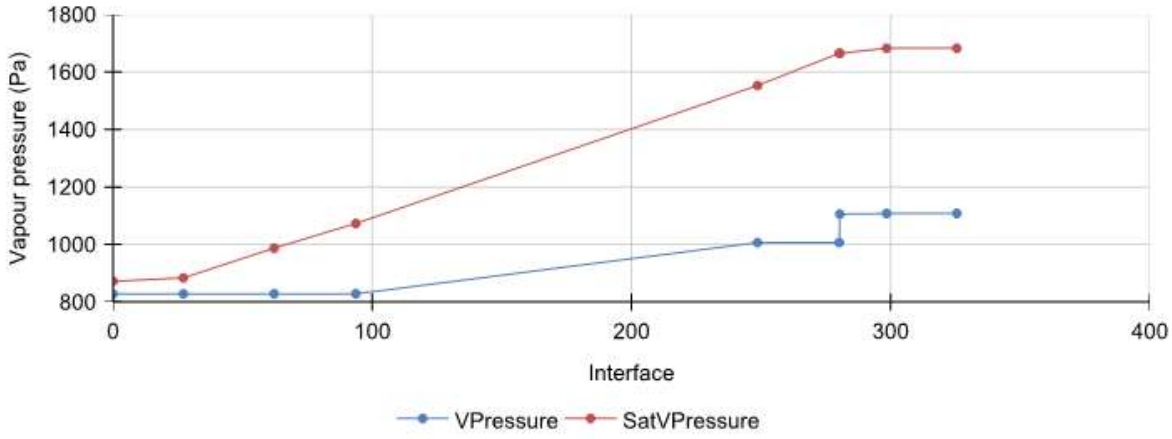
| Layer | Thickness mm | Thermal conduct. W/m.K | Thermal resistance m².K/W | Cumulative thermal resistance m².K/W | Vapour resistivity GN.s/kg.m | Vapour resistance GN.s/kg.m | Cumulative vapourt resistance GN.s/kg.m |
|---|---|---|---|---|---|---|---|
| External surface | - | 0.0000 | 0.1700 | 0.1700 | 0.0 | 0.00 | 0.00 |
| 1.Boost'R Hybrid / Battens | 35.0 | 0.0000 | 1.3500 | 1.5200 | 0.000 | 0.55 | 0.55 |
| 2.Hybris - Associated Air Gap / Joists | 31.5 | 0.0000 | 1.0300 | 2.5500 | 0.0 | 0.00 | 0.55 |
| 3.Hybris / Joists | 155.0 | 0.0330 | 4.6970 | 7.2470 | 0.000 | 450.00 | 450.55 |
| 4.Hybris - Associated Air Gap / Joists | 31.5 | 0.0000 | 0.9090 | 8.1560 | 0.0 | 0.00 | 450.55 |
| 5.Polythene, 500 gauge | 0.3 | 0.0000 | 0.0000 | 8.1560 | 0.000 | 250.00 | 700.55 |
| 6.Chipboard | 18.0 | 0.1300 | 0.1385 | 8.2944 | 300.0 | 5.40 | 705.95 |
| Internal surface | - | 0.0000 | 0.1700 | 8.2944 | 0.0 | 0.00 | 705.95 |

### Vapour pressure table

| Interface - between layers | Interface temp. °C | Vapour pressure Pa | Satur. vapour pressure Pa | Dew point °C | Cond. rate g/m² h | Cond. rate 60 days g/m² h | Cond. risk Y/N |
|---|---|---|---|---|---|---|---|
| External surface | 5.00 | 828.3 | 871.9 | 4.27 | 0.00 | 0.00 | No |
| 1. External surface / Boost'R Hybrid / Battens | 5.20 | 828.3 | 884.2 | 4.3 | 0.00 | 0.00 | No |
| 2. Boost'R Hybrid / Battens / Hybris - Associated Air Gap / Joists | 6.80 | 828.5 | 987.4 | 4.3 | 0.00 | 0.00 | No |
| 3. Hybris - Associated Air Gap / Joists / Hybris / Joists | 8.01 | 828.5 | 1073.1 | 4.3 | 0.00 | 0.00 | No |
| 4. Hybris / Joists / Hybris - Associated Air Gap / Joists | 13.56 | 1006.7 | 1552.8 | 7.1 | 0.00 | 0.00 | No |
| 5. Hybris - Associated Air Gap / Joists / Polythene, 500 gauge | 14.64 | 1006.7 | 1664.8 | 7.1 | 0.00 | 0.00 | No |
| 6. Polythene, 500 gauge / Chipboard | 14.64 | 1105.7 | 1664.8 | 8.5 | 0.00 | 0.00 | No |
| Chipboard / Internal surface | 14.80 | 1107.9 | 1682.5 | 8.5 | 0.00 | 0.00 | No |
| Internal surface | 15.00 | 1107.9 | 1682.5 | 8.48 | 0.00 | 0.00 | No |

## CONDENSATION RISK ANALYSIS

Design SAP
elmhurst energy




**Interface temperature / Dew point graphical representation**