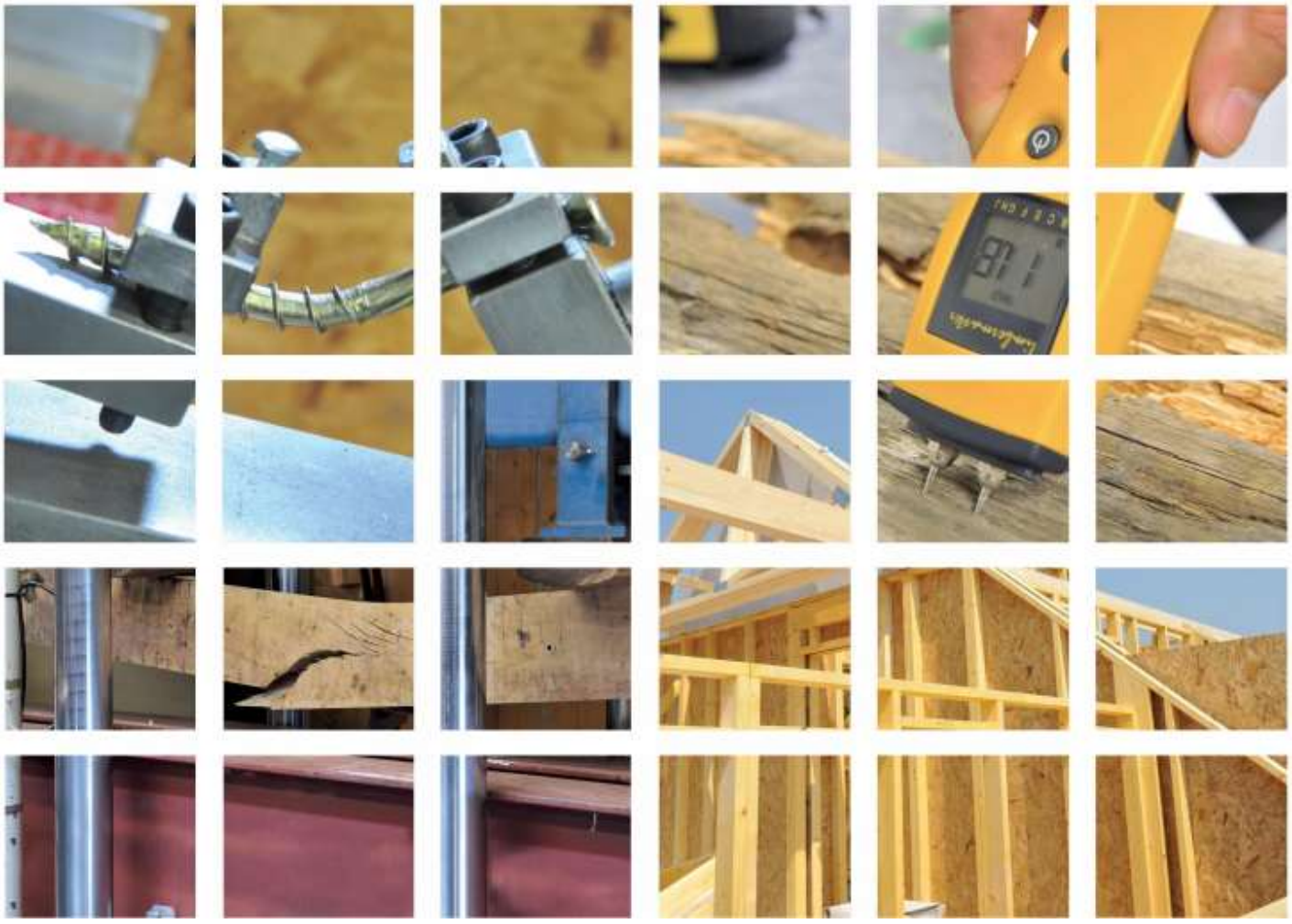
Q-Mark Registration Schedule

Honeycomb Insulation

Hybris

ACTIS SA
30 Avenue de Catalogne
11300 Limoux
France



Q-Mark Registration Schedule

Holder of Q-Mark		ACTIS SA
Product Name		Hybris
Type and Use of Product		Intended for use as Insulation in Roofs, Walls and Floors
Validity:	**From**	20/01/2020
	To	03/03/2022
Date of This Issue		20/01/2020
Issue Number		4
This Issue Replaces		Revision 04/03/2019
Relates to Certificate Number		BIPS-0106
Manufacturing Address/s		30 Avenue de Catalogne 11300 Limoux France
This Schedule Contains		32 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 has been assessed in accordance with EAD 04000700-1201, 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 careful 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 which 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

HYBRIS is honeycomb insulating product consisting of an inner core of shaped polyethylene foam layers with outer surfaces of aluminium coated polyethylene foils. The inner foam layers are combined with aluminium coated foils creating triangular shaped cavities. The layers are assembled by thermo-gluing. It is available in rolls or as compressed flat panels, see Tables 1a and 1b.

The product has the following certifications/assessments associated to it:

- CE Certification by ACTIS in accordance with ETA 18/0357 (issued by CSTB)

- Independent Third Party Certification by Eurofins Expert Services Ltd, certificate number C-9432-13.

The nominal characteristics of the HYBRIS product are given in Table 1a, for rolls and Table 1b for flat panels.

Table 1a**: **Nominal Characteristics - Rolls

Property	HYBRIS
Thickness (mm)	Min 30 up to 300 (in increments of 15)
Weight/unit area (kg/m^3)	<9.5
Roll length (m)	1.7 (300mm thick) - 11.7 (30mm thick)
Roll width (mm)	600 / 1200

Table 2b**: **Nominal Characteristics – Flat Panels

Property	HYBRIS
Thickness (mm)	Min 50 up to 205 (in increments of 10 or 15)
Weight/unit area (kg/m3)	<9.5
Panel Dimensions (mm)	1200 x 1145

4.2 Intended Use

Under the scope of this certification, HYBRIS insulation has been approved for use in:

- roofs (pitched roofs between and under rafters, loft insulation and flat roof insulation)
- Walls (timber frame, masonry constructions and partition walls).
- Floor (Suspended Timber Floor Constructions)

Non-ventilated air gaps on the external surfaces can be included in order to improve the HYBRIS thermal efficiency.

For most configurations, the HYBRIS insulation product should be complemented by an independent and continuous vapour barrier and breathable underlay that also ensures the function of air tightness and a good condensation risk management with other elements in the building. Underlays and vapour barriers can be installed in direct contact with HYBRIS or there may be a non-ventilated air gap between the reflective surface and the underlay/vapour control layer.

The low emissivity of the two outer faces contributes to the thermal performance of the product when accompanied by unventilated air gaps.

5 BUILDING REGULATIONS

HYBRIS insulation is certified under the BM TRADA Q-Mark Building Insulation Products Scheme. It is the opinion of BM TRADA that if used in accordance with the requirements of this Scheme and in accordance with the installation manual, then the product will satisfy, or contribute to satisfying the relevant requirements of the following Regulations:

- The Building Regulations 2010 (England and Wales)
- The Building (Scotland) Regulations 2004

- The Building Regulations (Northern Ireland) 2000.
- The Building Regulations (Ireland) 1997

6 NHBC ACCEPTANCE

When used strictly in accordance with the principles set out in this Q-Mark Schedule, HYBRIS can be used on homes covered by an NHBC Warranty.

7 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.

7.1 Quality Management System (QMS)

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

The QMS is subject to periodic audit (not less than once per year).

All new Members are subject to an initial inspection.

7.2 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)

7.2.1 Manufacturing Documentation

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

8 MINIMUM QMS REQUIREMENTS

8.1 Factory Production Control

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.

8.2 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.

8.3 Company Representative

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

8.4 Internal Audits

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

8.5 Documentation

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

8.6 Work Instructions

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

8.7 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.

8.8 Traceability

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

8.9 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.

8.10 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.

8.11 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.

8.12 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.

9 OTHER REQUIREMENTS OF THE SCHEME

9.1 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.

10 TRANSPORT, STORAGE AND INSTALLATION INSTRUCTIONS

10.1 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.

10.2 Transport and Storage

The products shall be supplied in either:

- free rolls of surfaces from $2m^2$ (300mm thick) to $14m^2$ (30mm thick).
- flat panels measuring 1200mm x 1145mm with thickness between 50mm and 205mm

Each roll or panel bears a label indicating the product name, the name of the manufacturer, the name of the certificate holder if different, the dimensions of the product, information of date of manufacturing and the BM TRADA Q-Mark logo and Certificate Number.

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

10.3 Installation

10.3.1 General

Installation of HYBRIS insulation, may be complemented by an independent and continuous vapour barrier and breathable underlay that also ensures the function of the air tightness and a good condensation risk management. The Hybris insulation must be carefully installed to ensure continuity of insulation.

If a separate VCL is not used, then joints between HYBRIS insulation must be sealed with an ACTIS adhesive tape in order to provide adequate continuous contact, to prevent thermal bridging and moisture movement.

When the insulation is installed between rafters/studs/joists, Hybris should be cut to a width equal to the centre distance between the rafters/studs/joists plus for rolls an additional 40mm, and for panels an additional 5-10mm See ACTIS Installation guide for further details.

Cutting of the HYBRIS insulation may be done manually with an insulation saw on a flat surface; other manual or electrical saws/knives are also suitable for cutting the insulation product.

HYBRIS is friction fit. For extra support the product is stapled to timbers and joists between adjacent HYBRIS sheets are taped.

10.3.2 Roof/Wall Underlay and Vapour / Air Barrier Installation

When installing HYBRIS insulation in a roof structure the following steps shall be followed in order to protect the structure and provide a water tight seal:

- A water tight and vapour permeable underlay membrane shall be used when the underlay is installed without a ventilated air gap between the insulation and the

underlay. The water vapour resistance of the vapour or air barrier shall meet the requirements of local regulations.

- All roofing underlay joints shall have an overlap of at least 100mm in roofs with slopes of 1:3 and 200mm in roofs with slopes below 1:3, or as recommended by the product manufacturer.
- The underlay shall be fastened at no more than 900mm c/c on supports and joints should be taped
- The water vapour permeability of the roof underlay membrane in the roof or wind barrier in unventilated walls should be at least 5 times higher than the vapour/air barrier on the inside of the wall.

10.3.3 Timber Frame Wall Installation

The wall to be insulated must be watertight and weatherproof; the surfaces to be covered should also be firmly fixed, clean, dry and smooth. The insulation should cover at least half of the depth of the stud from the inside face.

A typical HYBRIS installation in a timber frame wall structure is shown in Figure 1, and typical installation instructions are detailed as follows:

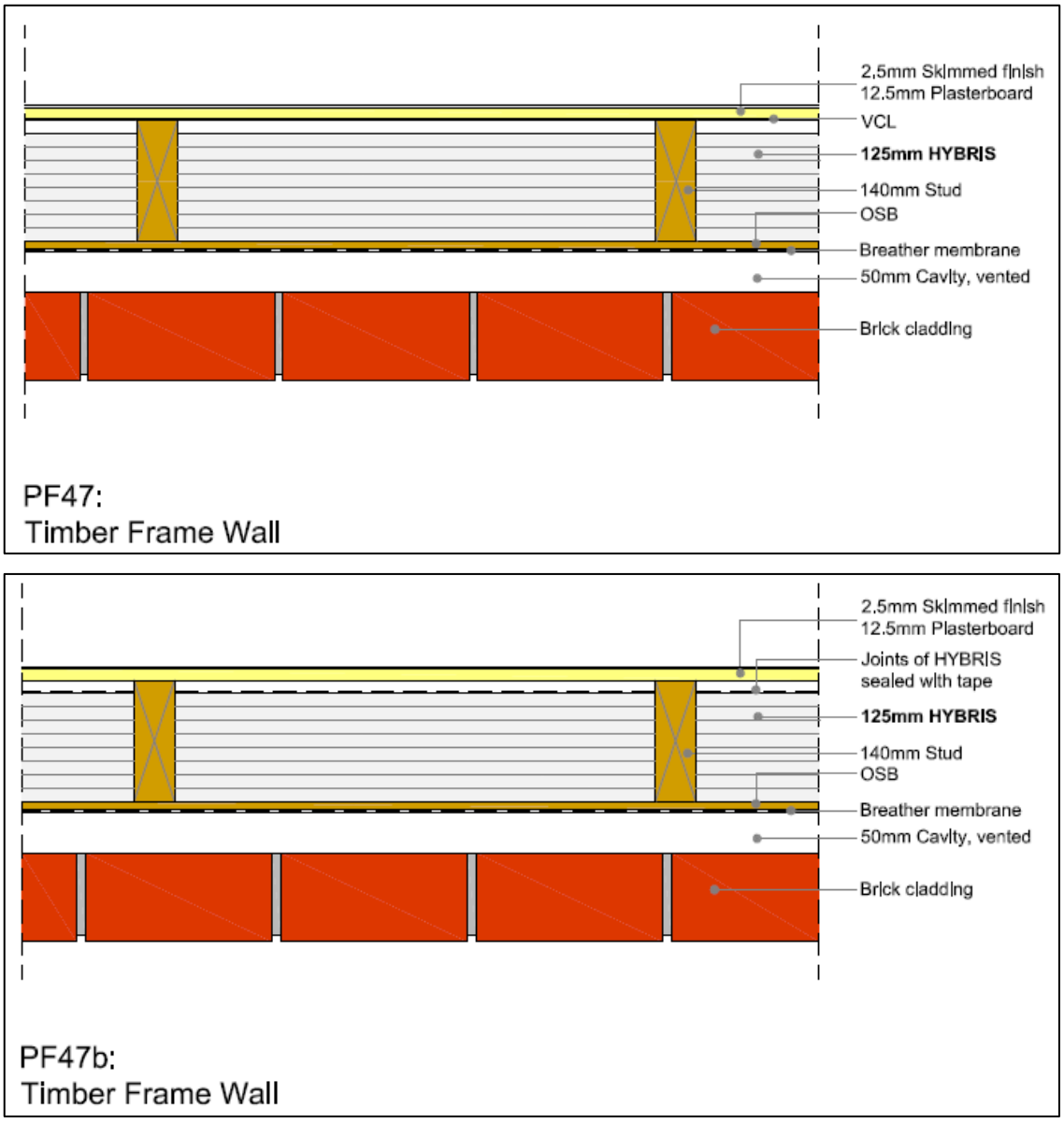


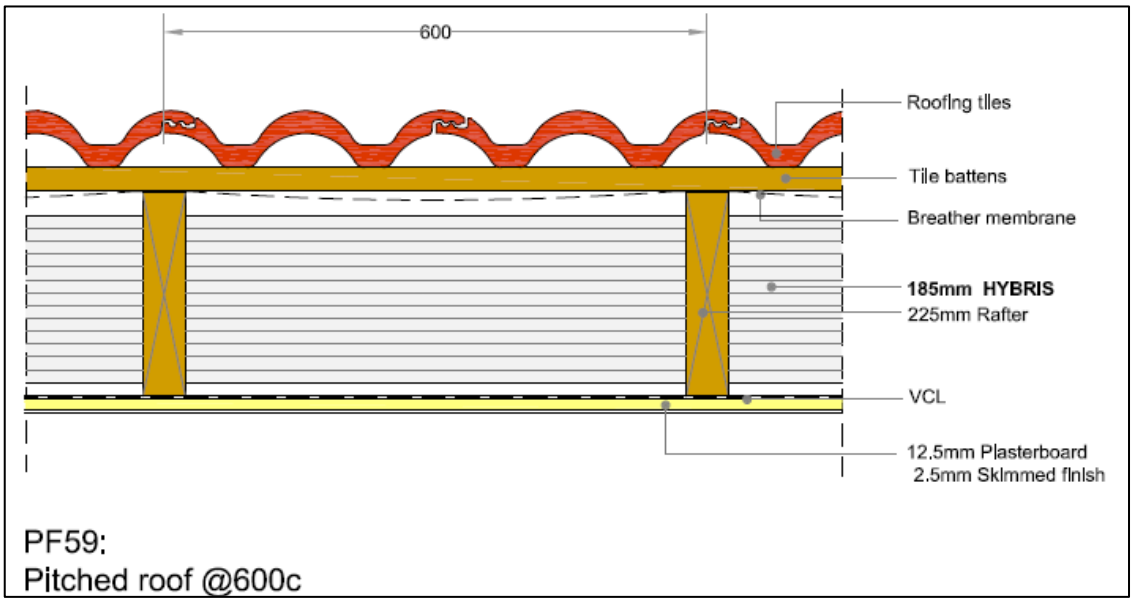
Figure 1: Typical HYBRIS installation in timber frame wall structure – top with VCL, bottom with ACTIS joint sealing tape, VCL not required.

- HYBRIS insulation is located between studs, installed in one layer filling the space between studs or leaving an air gap between the HYBRIS panel and the adjacent structure.
- For rolls, cut the material to a width equal to the clear space of the studs plus 40mm and to a length equal to the distance between floor and ceiling plus 10mm. For panels cut the material to a width equal to the clear space plus 5-10mm. To ensure thermal continuity, the inner face joints of the HYBRIS panels should be sealed with ACTIS adhesive tape prior to installation.
- A vapour barrier layer is stapled on the studs and overlaps are sealed with adhesive tape. Floor and ceiling joints should be tightly sealed using appropriate sealant.
- The thickness of HYBRIS is chosen based on the thermal performance required.

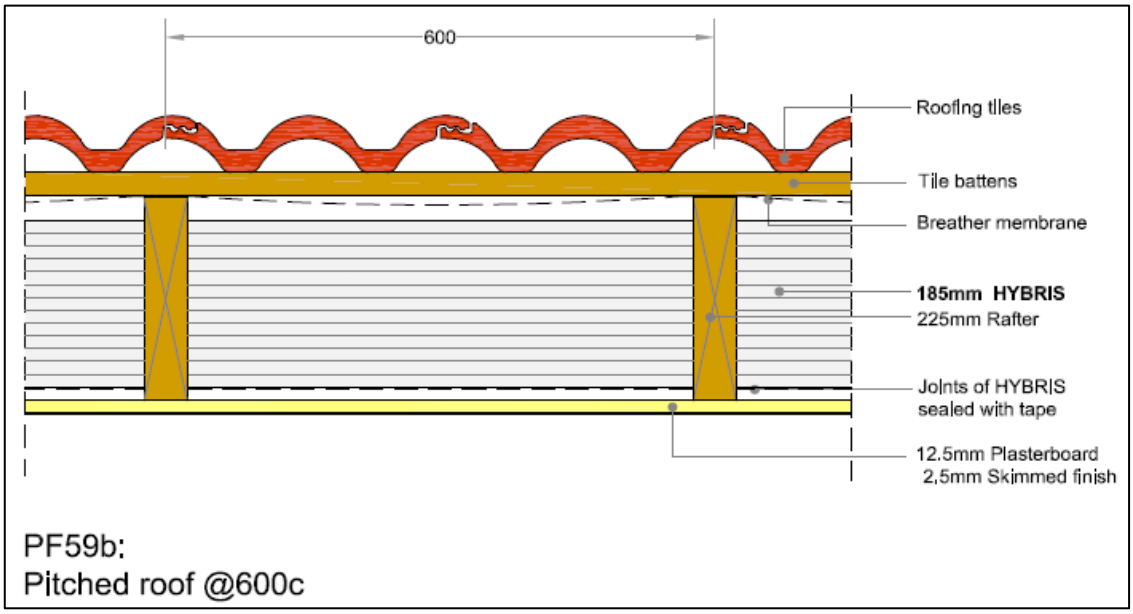
10.3.4 Pitched Roof Installation

The thickness of the insulation shall be based on the thermal performance required and it should be at least half of the depth of the rafters.

The HYBRIS can be installed in one layer (between rafters) or two layers (between and under rafters). A typical pitched roof installation is shown in Figure 2 and details are given as follows:



PF59:
Pitched roof @600c



PF59b:
Pitched roof @600c

Figure 2: Typical HYBRIS Installation with one layer – top with VCL, bottom with ACTIS joint sealing tape, VCL not required.

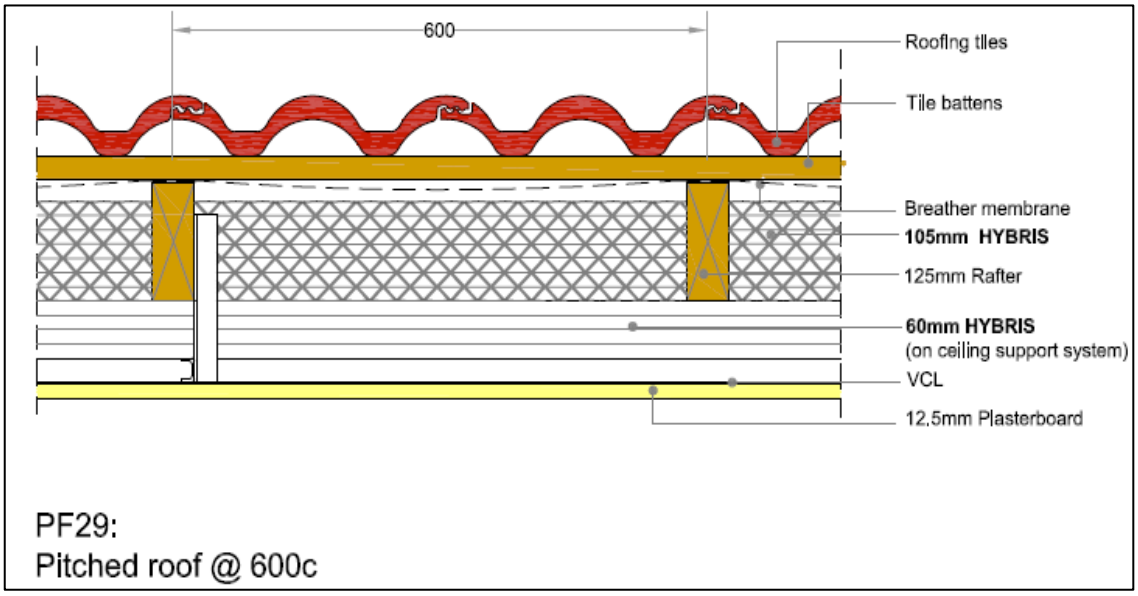


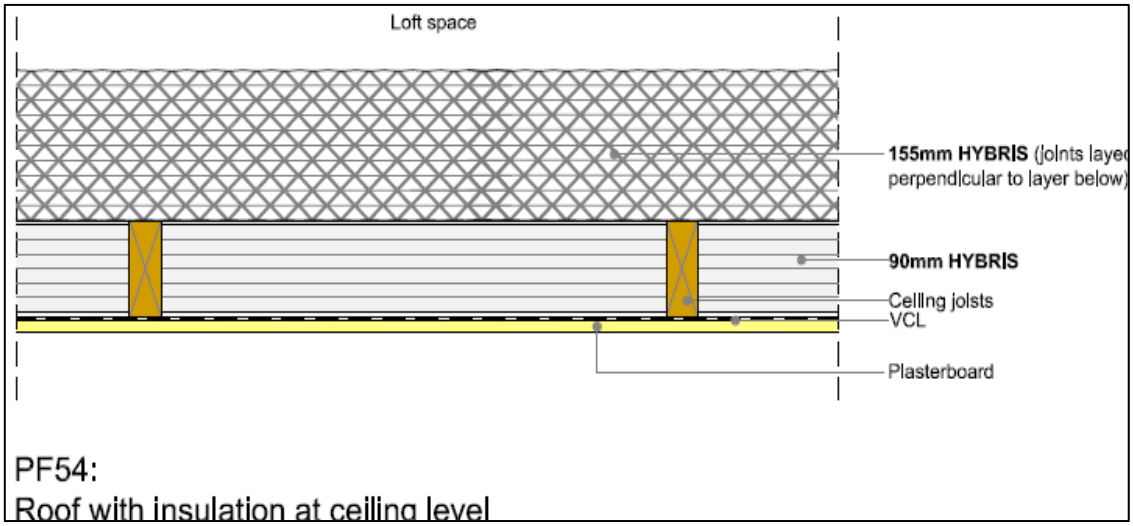
Figure 3: Typical HYBRIS Installation with Two Layers

- HYBRIS can be installed up to the underside of the underlay.
- When installing two layers of Hybris, the second layer should be installed perpendicular to the rafters between the timber battens or supports using, for example, a proprietary metallic frame system.
- The overlaps of the vapour control layer installed inside the batten/frame must be sealed with adhesive tape; the ceiling/wall junctions should also be adequately sealed.

10.3.5 Loft / Attic Installation

The HYBRIS insulation can be installed in lofts/attics, in between and over ceiling joists of timber frame structures. The insulation can be installed in one layer between or over ceiling joists, or two layers with staggered joints or cross laid joints.

A typical example of HYBRIS insulation installation in a loft in one layer is showed in Figure 4 below.



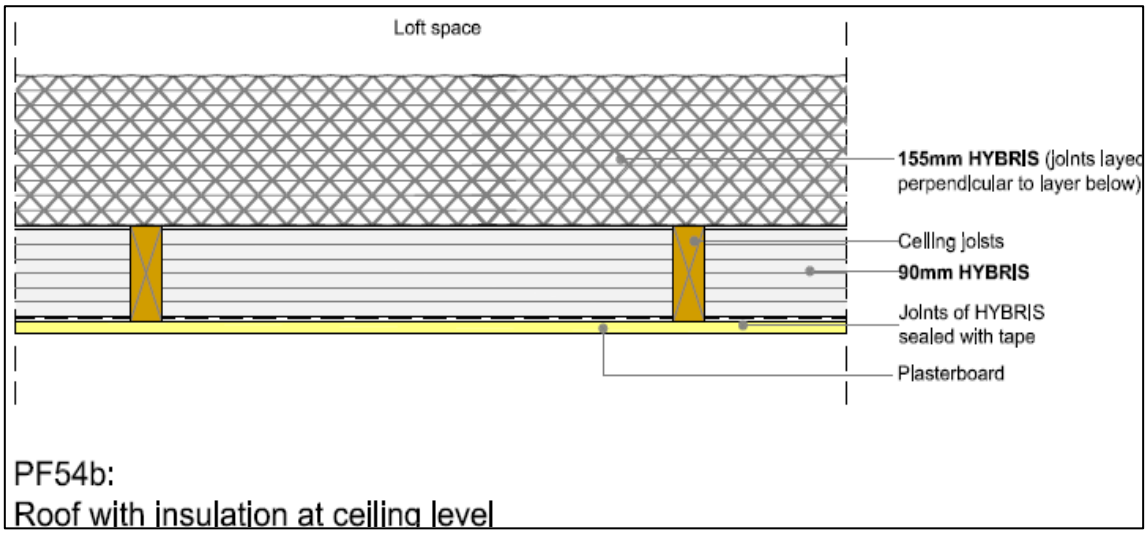
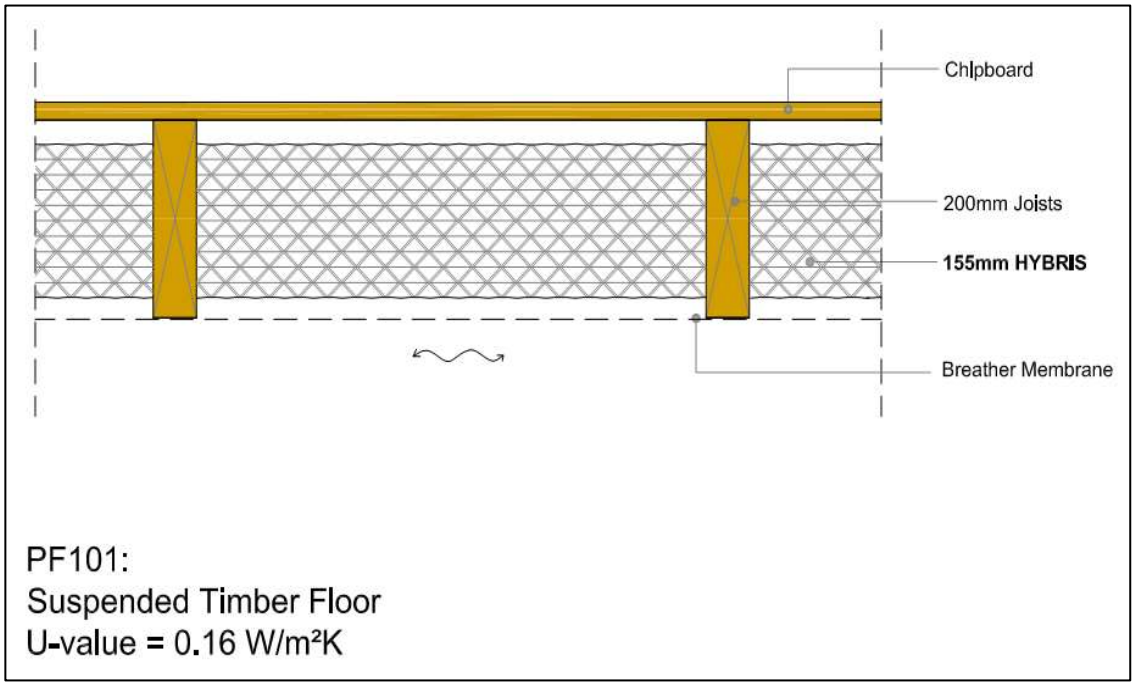


Figure 4: Typical Installation of HYBRIS in two layers between and over ceiling joists

- For rolls, cut the material to a width equal the clear space between the ceiling joists plus 40mm. For panels cut the material to a width equal to the clear space plus 5-10mm.
- If the loft is boarded, then the insulation shall be laid on the boards and butt jointed, but NOT sealed.
- If a second layer is used this is then placed over the first one with offset or cross-laid joints.
- Care must be taken to ensure that any penetrations and perimeters of joints between roofs and walls are sealed correctly.
- Loads must not be stored on HYBRIS.

10.3.6 Floor Installation



11 TEST AND VERIFICATION REQUIREMENTS

11.1 Test Reports and Sampling

BM TRADA has assessed the results of testing and sampling, and/or calculation that has been carried out in accordance with the scheme rules.

HYBRIS is a non-load bearing product, however it will resist normal loads associated with installation and use.

11.2 Initial Type Testing

The product has been assessed by Eurofins Expert Services Ltd and has been issued a certificate, Number C-9432-13. A European Technical Assessment, ETA 18/0357, has also been issued for the product. Initial type testing was performed by VTT Expert Services Ltd and emissivity testing was carried out by FIW.

11.2.1 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
- Peel strength of tape and tensile strength parallel to faces of tape
- Resistance to nail tearing (nail shank)
- Water Tightness
- Water Vapour Transmission
- Air permeability
- Thermal Resistance

The test results are summarised in the Tables below. Dimensional measurements were also recorded as shown below.

Table 2a: Dimension Properties of HYBRIS Insulation - Rolls

Property	Test Method	Declared Values
Thickness (mm)	EN 823	30/45/60/75/90/105/120/135/150/165/180/ 195/210/225/240/255/270/285/300
Density (kg/m^3)	EN 1602	≤9.5
Length (m)	EN 822	2 (300mm thick) - 8 (30mm thick)
Width (mm)	EN 822	600 / 1200

Table 2b: Dimension Properties of HYBRIS Insulation - Panels

Property	Test Method	Declared Values
Thickness (mm)	EN 823	50/60/75/90/100/105/120/125/140/155/170/ 185/195/205
Density (kg/m^3)	EN 1602	<9.5
Length (m)	EN 822	1.2
Width (mm)	EN 822	1145

Table 3: Tensile Strength of HYBRIS – Tested in Accordance with EN 1608

Direction	Longitudinal, kPa	Transversal, kPa
Before ageing	65	48
Direction	Longitudinal, N/50mm	Transversal, N/50mm
After ageing	74	52

Table 4 Peel Strength of Tape and Tensile Strength of HYBRIS to Faces of Tape

Direction	Property	Test Method	Declared Value
Before ageing	Peel strength of tape, N/100mm	EN 11339	22 (adhesion failure)
	Tensile strength parallel to faces of tape, N/100mm	EN 1608	116
After ageing	Peel strength of tape, N/100mm	EN 11339	At 98 the HYBRIS surface is torn
	Tensile strength parallel to faces of tape, N/100mm	EN 1608	132

Table 5: Resistance of HYBRIS to nail shank tearing (N) before and after ageing to EN 12310-1 Part 1

Direction	Longitudinal, N	Transverse, N
Before ageing	190	180
After ageing	199	188

Table 6: Water Vapour Transmission of HYBRIS - EN 12572 set C

Property	Declared values
Permeance (W), kg/m^2.s.Pa	<2,3 E-12
Vapour resistance (Z), MNs/g	>450
Diffusion eq. air layer thickness (Sd), m	>90

Water tightness and air permeability were assessed based on the composition and estimated as having a watertight and airtight performance.

11.2.2 Safety in Case of Fire

11.2.2.1 Reaction to Fire

Hybris has been tested in accordance with EN ISO 11925-2 and has been classified as Class F reaction to fire in accordance with EN 13501-1.

Furthermore, it has been demonstrated by testing that the presence of Hybris insulation behind a plasterboard layer does not affect the reaction to fire rating of the plasterboard.

11.2.2.2 Resistance to Fire

HYBRIS has been tested within two loadbearing timber frame wall assembly types by Warrington Fire in accordance with EN1365-1. The wall assemblies satisfied the performance requirements of the standard for the period of 34 and 38 minutes. Refer to Reports Nos. 398423 and 398426.

The results should only be used in conjunction with walls that fall within the "Field of Direct Application stated in the test reports.

11.2.3 Hygiene, Health and Environment

11.2.3.1 Risk of Condensation

The national Building Regulations applicable to each application shall be followed when designing structures using HYBRIS insulation and taking into account water vapour permeability and air tightness of the structure.

For each application, condensation risk calculations as defined in BS 5250 shall be carried out in accordance with the BS 6946 and BR 443 guidance document.

Examples of U-value and condensation risk calculations are shown in Annex 3.

11.2.3.2 Release of Dangerous Substances

The member declared that HYBRIS insulation does not contain any known dangerous substances.

11.2.4 Safety in Use

Not relevant.

11.2.5 Protection against Noise

The acoustic performance of various wall/roof structures incorporating Hybris as part of the structure has been evaluated by ACTIS. Guidance should be sought from ACTIS on the acoustic performance of a specific structure.

11.2.6 Energy Economy and Heat Retention

The thermal performance of HYBRIS insulation has been measured in accordance to EN 12667. The outer surfaces emissivity has been carried out in accordance with EN 16012. The thermal performance and emissivity declared values are as given in the following tables. Note that Table 7a refers to the rolled product and Table 7b refers to the panel product.

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

Table 7a: HYBRIS Insulation Thermal Performance –"R" Declared Values - Rolls

HYBRIS Thickness	Declared Thermal Resistance	HYBRIS Thickness	Declared Thermal Resistance
mm	[m^2K/W]	mm	[m^2K/W]
30	0.90	180	5.45
45	1.35	195	5.90
60	1.80	210	6.35
75	2.25	225	6.80
90	2.70	240	7.25
105	3.15	255	7.70
120	3.60	270	8.15
135	4.05	285	8.60
150	4.50	300	9.05
165	5.00		

Table 7b: HYBRIS Insulation Thermal Performance –"R" Declared Values - Panels

HYBRIS Thickness	Declared Thermal Resistance	HYBRIS Thickness	Declared Thermal Resistance
mm	[m^2K/W]	mm	[m^2K/W]
50	1.5	140	4.20
60	1.8	155	4.65
75	2.25	170	5.15
90	2.70	185	5.60
105	3.15	195	5.90
120	3.60	205	6.20
125	3.75		

Table 8: HYBRIS Insulation Surface Emissivity Performance

Characteristic	Declared Values
Emissivity of the inner side	0.06
Emissivity of the outer side	0.10

The resistance of air cavities on either side of the product may be calculated in accordance with EN ISO 6946.

Hybris has been assessed as having a thermal heat capacity of 2300 J/kg.K.

11.3 Aspects of Durability

HYBRIS insulation will remain an effective insulation 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.

The ageing behaviour of the HYBRIS insulation was verified in accordance with the requirements of the EAD for radiant reflective products. The product was exposed to 28 days ageing at 70^0C and 90% Relative Humidity. Mechanical properties were checked after ageing. For emissivity, the product was exposed to ageing in accordance with EN 16012.

12 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.

13 GUARANTEES

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

14 ANNEX 1: EVIDENCE/DOCUMENTS USED IN THIS ASSESSMENT

1. HYBRIS insulation product for roof and wall and floor applications Eurofins Certificate No. C-9432-13, dated 20/07/2018.
2. European Technical Assessment ETA 18/0357 “Product with radiant heat reflective component for use as thermal insulation system for building envelopes.
3. ACERMI Certificate No. 15/189/1047. Association pour la certification des materiaux isolants.

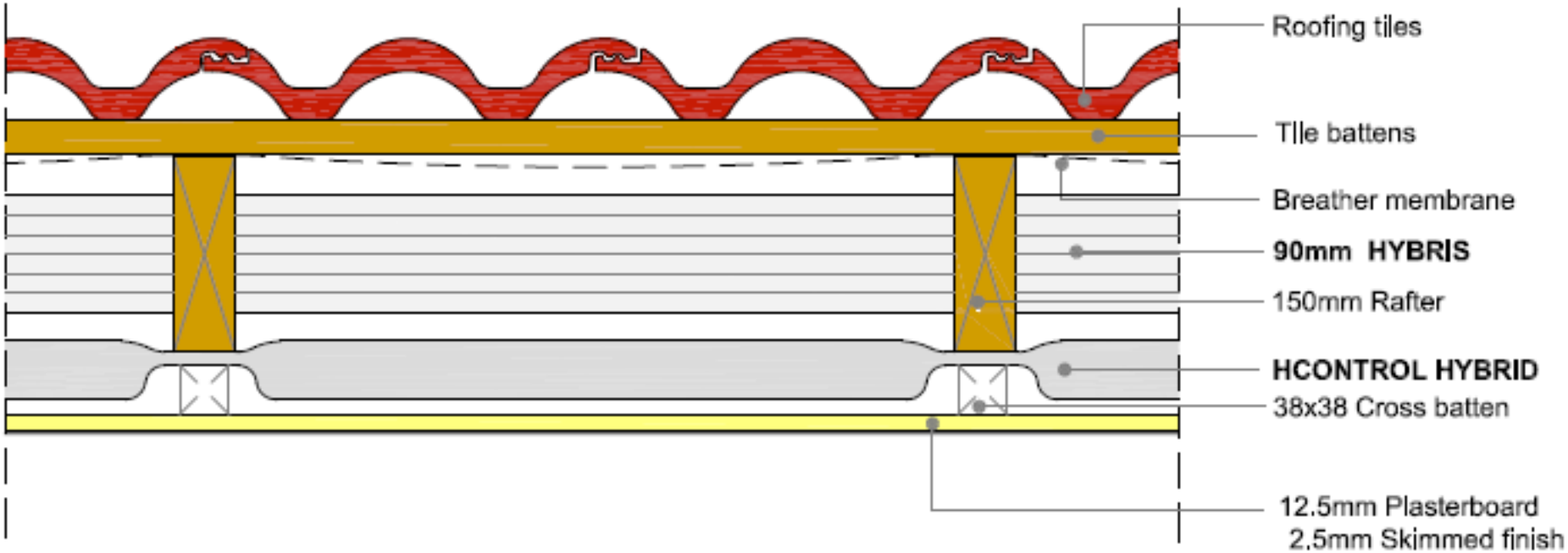
15 ANNEX 2: NORMATIVE REFERENCES

1. BS EN 822:1995 - Thermal insulating products for building applications. Determination of length and width
2. BS EN 823:1995 - Thermal insulating products for building applications. Determination of thickness
3. BS EN 1602:1997 - Thermal insulating products for building applications. Determination of apparent density
4. BS EN1608:1997 - Thermal insulating products for building applications. Determination of tensile strength parallel to faces
5. BS EN ISO 11339:2010 - Adhesives. T-peel test for flexible-to-flexible bonded assemblies.
6. BS EN 12310-2:2000 - Flexible Sheets for Waterproofing. Determination of Resistance to tearing (nail shank). Plastic and rubber sheets for roof waterproofing.
7. BS EN 16012 - Thermal insulation for buildings – Reflective insulation products – Determination of the declared thermal performance
8. BS EN ISO 6946:1997 - Building Components and Building Elements. Thermal Resistance and thermal transmittance. Calculation method.
9. BS EN ISO 12572:2001 - Hygrothermal performance of building materials and products. Determination of water vapour transmission properties.
10. EAD 040007-00-1201 - Thermal insulation products for buildings with radiant heat reflective component.

16 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 Certification.

- Non-ventilated pitched roof with Hybris and HControl Hybrid
- Non-ventilated pitched roof with Hybris insulation
- Timber frame wall with Boost^{R} Hybrid, HControl Hybrid and Hybris insulation
- Suspended Timber Floor



PF31:
Pitched roof @ 600c
U-value = 0.18 W/m²K

UVALUE CALCULATION

Users Ref: 00 PATHFINDER 2016 (PANELS) **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 Roof PF31 - r-tp HCH+H90=0.18

Roof Type: Pitched Roof, insulated sloping ceiling

Layer	Description	Thickness	λ	R	Fraction
External surface				0.040	
Layer1	**Tiling, clay**				
	Main construction	15 mm	1.000	0.015	100.00 %
Layer2	**Standard cavity**				
	Main construction	25 mm	0.313	0.080	87.33 %
	Corrections - Cavity Slightly ventilated, Emissivity: Normal				
	Bridging - Timber	25 mm	0.130	0.000	12.67 %
Layer3	**Breather membrane**				
	Main construction	0 mm	0.500	0.001	100.00 %
Layer4	**Hybris - Associated Air Gap / Rafter 140mm**				
	Main construction	15 mm	0.037	0.407	92.17 %
	Bridging - Timber	15 mm	0.130	0.000	7.83 %
Layer5	**Hybris / Rafter 140mm**				
	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 %
Layer6	**Hybris - Associated Air Gap / Rafter 140mm**				
	Main construction	15 mm	0.032	0.474	92.17 %
	Bridging - Timber	15 mm	0.130	0.000	7.83 %
Layer7	**HControl Hybrid**				
	Main construction	45 mm	0.024	1.900	93.67 %
	Bridging - Timber	45 mm	0.130	0.000	6.33 %
Layer8	**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 %
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				0.100	

Total resistance: Upper limit = 5.780 m²K/W Lower limit = 5.048 m²K/W Average = 5.414 m²K/W
U-value (unrounded) = 0.1847 W/m²K

Unheated space: None

Total thickness: 231 mm **U-value: 0.18 W/m²K**

CONDENSATION RISK ANALYSIS

Users Ref: 00 PATHFINDER 2016 (PANELS)

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

Roof PF31 - r-tp HCH+H90=0.18

Environmental conditions:

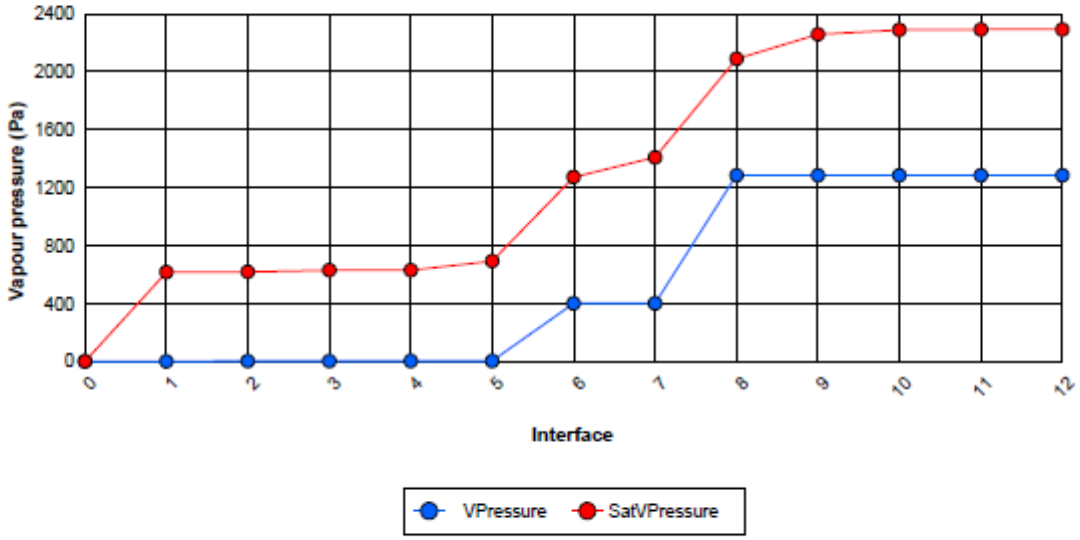
External conditions:	Temperature: 0 °C	Relative Humidity: 95 %
Internal conditions:	Temperature: 20 °C	Relative Humidity: 55 %

Table of layers:

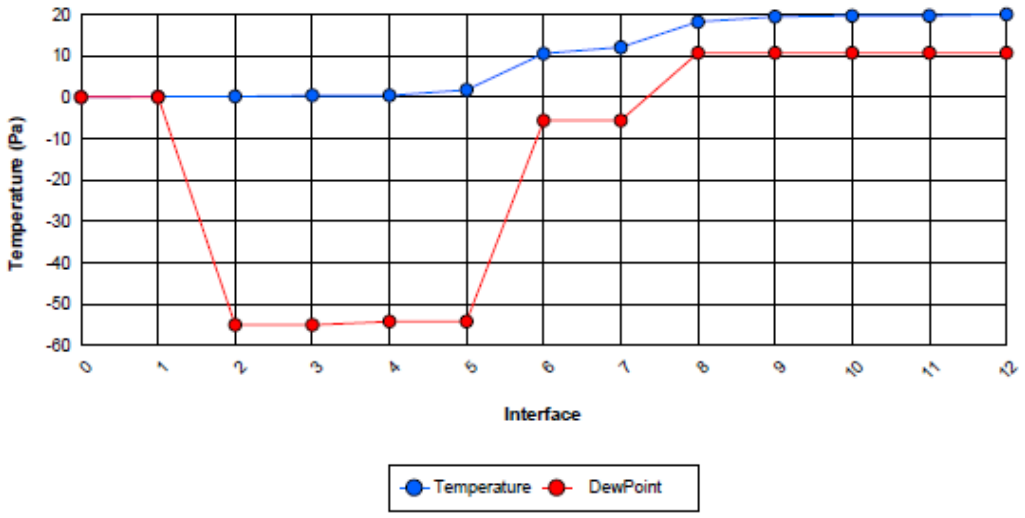
Layer	Width mm	Thermal conduct. W/m.K	Thermal resistance m2.K/W	Cumulative thermal resistance m2.K/W	Vapour resistivity GN.s/kg.m	Vapour resistance GN.s/kg	Cumulative vapour resistance GN.s/kg
External surface	-	0.000	0.040	0.040	0.000	0.000	0.00
1. Tiling, clay	15.0	1.000	0.015	0.055	250.0	3.75	3.75
2. Standard cavity	25.0	0.000	0.080	0.135	0.000	0.000	3.75
3. Breather membrane	0.4	0.500	0.001	0.136	0.000	0.40	4.15
4. Hybris - Associated Air Gap / Rafter 140mm	15.0	0.000	0.407	0.543	0.000	0.000	4.15
5. Hybris / Rafter 140mm	90.0	0.033	2.727	3.270	0.000	450.00	454.15
6. Hybris - Associated Air Gap / Rafter 140mm	15.0	0.000	0.474	3.744	0.000	0.000	454.15
7. HControl Hybrid	45.0	0.000	1.900	5.644	0.000	1,000.00	1,454.15
8. HControl Hybrid - Associated Air Gap / Batter	11.0	0.000	0.388	6.032	0.000	0.000	1,454.15
9. Plasterboard	12.5	0.190	0.066	6.098	45.0	0.56	1,454.71
10. Plaster, skim	2.5	0.400	0.006	6.104	60.0	0.15	1,454.86
Internal surface	-	0.000	0.100	6.104	0.000	0.000	1,454.86

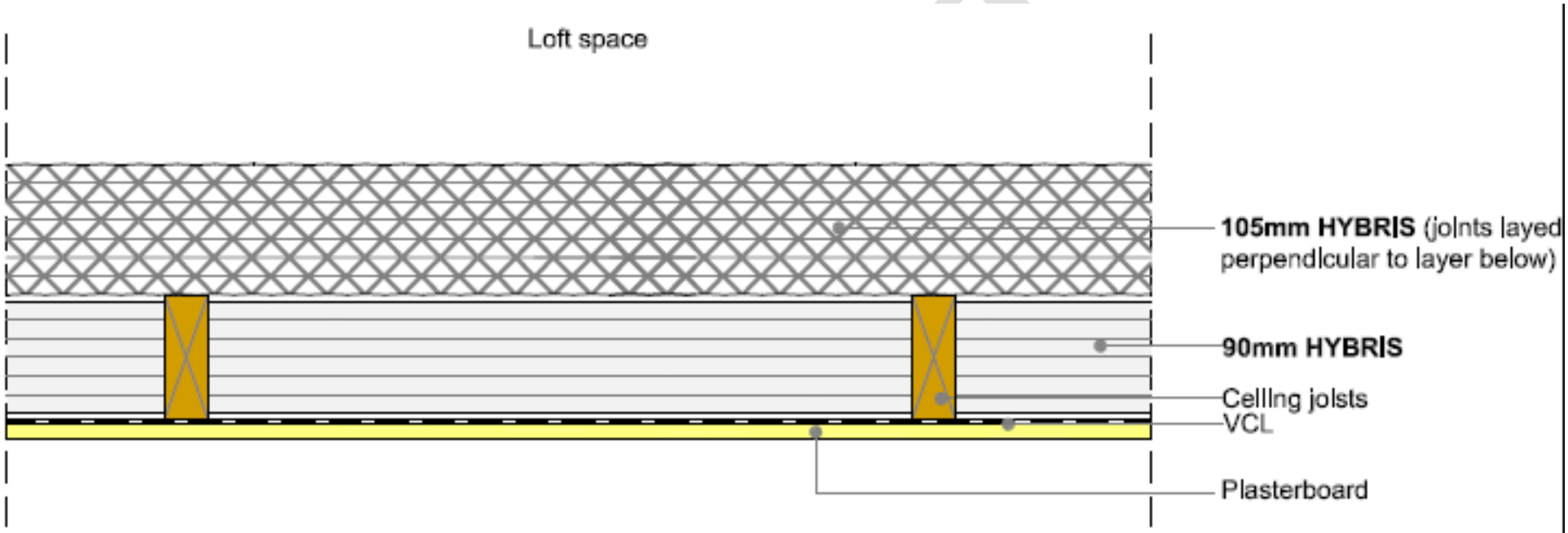
Vapour pressure table:

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	0.13	0.0	616.3	0.00	0.00	0.00	No
2. Tiling, clay / Standard cavity	0.18	3.3	618.4	-55.05	0.00	0.00	No
3. Standard cavity / Breather membrane	0.44	3.3	630.1	-55.05	0.00	0.00	No
4. Breather membrane / Hybris - Associated Air Gap / Rafter 140mm	0.44	3.7	630.2	-54.23	0.00	0.00	No
5. Hybris - Associated Air Gap / Rafter 140mm / Hybris / Rafter 140mm	1.75	3.7	692.8	-54.23	0.00	0.00	No
6. Hybris / Rafter 140mm / Hybris - Associated Air Gap / Rafter 140mm	10.54	401.2	1 272.6	-5.63	0.00	0.00	No
7. Hybris - Associated Air Gap / Rafter 140mm / HControl Hybrid	12.07	401.2	1 408.3	-5.63	0.00	0.00	No
8. HControl Hybrid / HControl Hybrid - Associated Air Gap / Batten 50mm	18.19	1 284.7	2 088.2	10.68	0.00	0.00	No
9. HControl Hybrid - Associated Air Gap / Batten 50mm / Plasterboard	19.45	1 284.7	2 257.9	10.68	0.00	0.00	No
10. Plasterboard / Plaster, skim	19.66	1 285.2	2 287.9	10.69	0.00	0.00	No
11. Plaster, skim / Internal surface	19.68	1 285.3	2 290.7	10.69	0.00	0.00	No
Internal surface	20.00	1 285.3	2 290.7	10.69	0.00	0.00	No



Interface temperature / Dew point graphical representation:





PF37:
Roof with Insulation at ceiling level
U-value = 0.16 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 PF37 - r-tc 90H+105H @600c =0.16

Roof Type: Pitched Roof, insulated sloping ceiling

Layer	Description	Thickness	λ	R	Fraction
External surface				0.040	
Layer1	**Loft space - Tiled roof with felt**				
	Main construction	1,000 mm	3.333	0.300	100.00 %
Layer2	**Hybris**				
	Main construction	105 mm	0.033	3.182	100.00 %
	Corrections - Air Gap: Level 0, Fasteners: None or plastic				
Layer3	**Hybris / Joists 100mm**				
	Main construction	90 mm	0.033	2.727	93.20 %
	Corrections - Air Gap: Level 0, Fasteners: None or plastic				
	Bridging - Timber	90 mm	0.130	0.000	6.80 %
Layer4	**Vapour Control Layer**				
	Main construction	0 mm	0.500	0.001	100.00 %
Layer5	**Plasterboard, skimmed finish**				
	Main construction	15 mm	0.190	0.079	100.00 %
Internal surface				0.100	

Total resistance: Upper limit = 6.233 m²K/W Lower limit = 5.975 m²K/W Average = 6.104 m²K/W

U-value (unrounded) = 0.1638 W/m²K

Unheated space: None

Total thickness: 1,210 mm **U-value: 0.16 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

Roof PF37 - r-tc 90H+105H @600c =0.16

Environmental conditions:

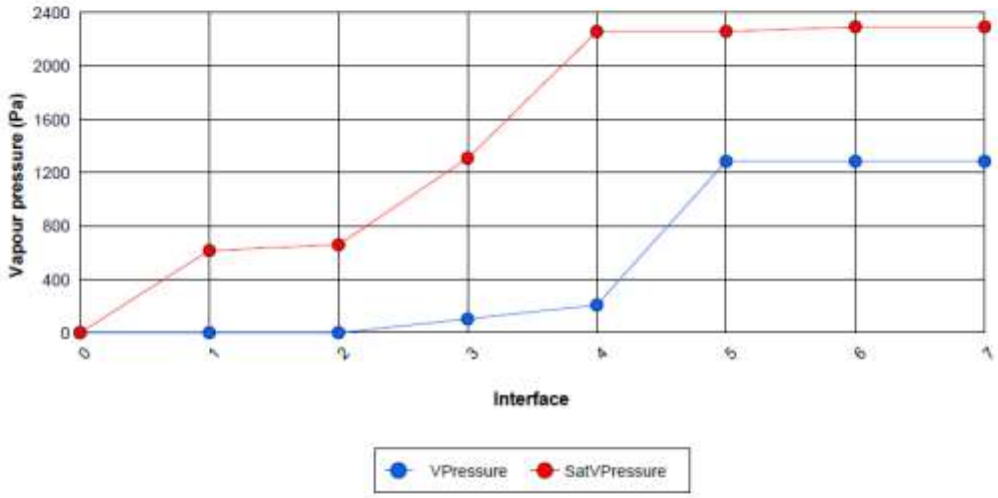
External conditions:	Temperature: 0 °C	Relative Humidity: 95 %
Internal conditions:	Temperature: 20 °C	Relative Humidity: 55 %

Table of layers:

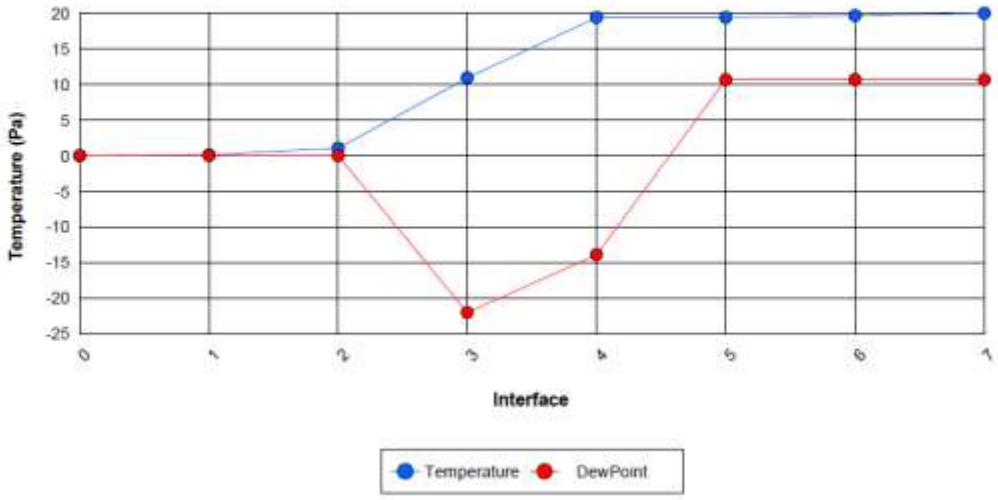
Layer	Width mm	Thermal conduct. W/m.K	Thermal resistance m2.K/W	Cumulative thermal resistance m2.K/W	Vapour resistivity GN.s/kg.m	Vapour resistance GN.s/kg	Cumulative vapour resistance GN.s/kg
External surface	-	0.000	0.040	0.040	0.000	0.000	0.00
1. Loft space - Tiled roof with felt	1,000.0	3.333	0.300	0.340	0.000	0.000	0.00
2. Hybris	105.0	0.033	3.182	3.522	0.000	450.00	450.00
3. Hybris / Joists 100mm	90.0	0.033	2.727	6.249	0.000	450.00	900.00
4. Vapour Control Layer	0.4	0.500	0.001	6.250	0.000	4,650.00	5,550.00
5. Plasterboard, skimmed finish	15.0	0.190	0.079	6.329	45.0	0.68	5,550.68
Internal surface	-	0.000	0.100	6.329	0.000	0.000	5,550.68

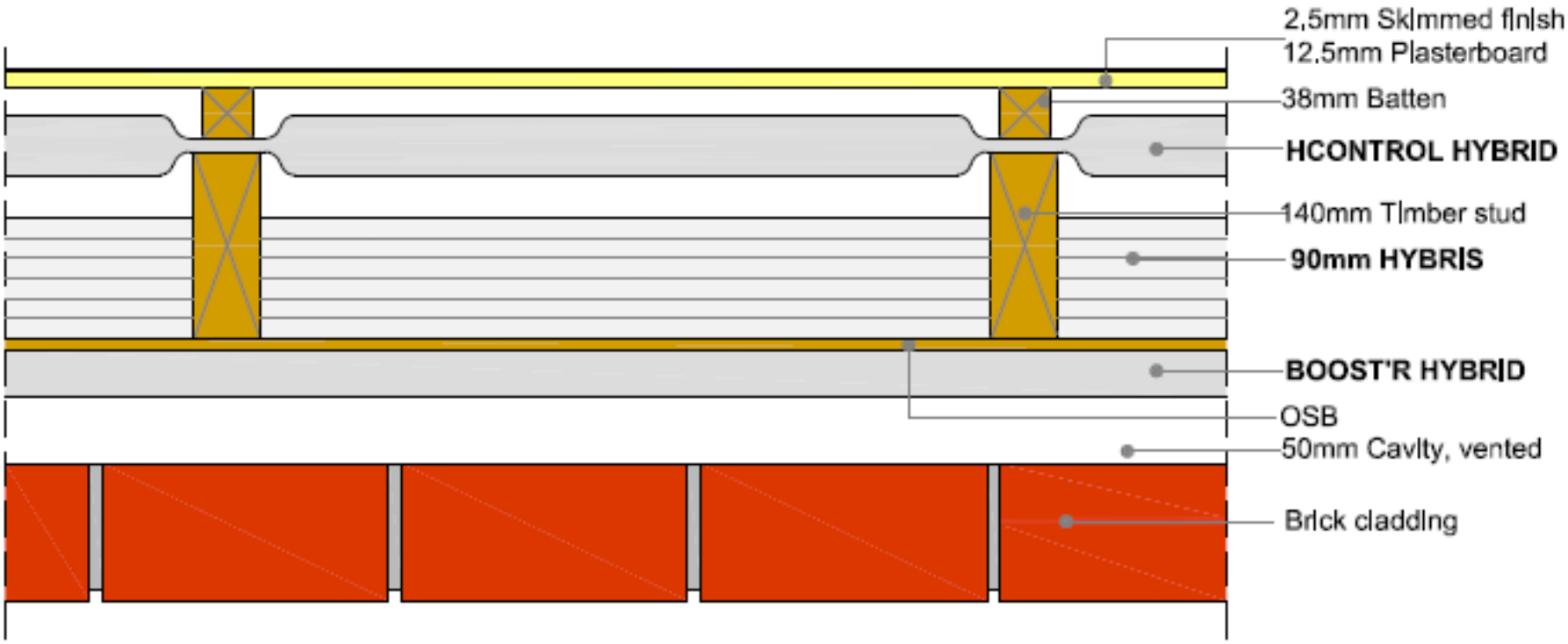
Vapour pressure table:

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 / Loft space - Tiled roof with felt	0.12	0.0	616.1	0.00	0.00	0.00	No
2. Loft space - Tiled roof with felt / Hybris	1.06	0.0	659.1	0.00	0.00	1.20	No
3. Hybris / Hybris / Joists 100mm	10.96	104.2	1 308.2	22.04	0.00	0.00	No
4. Hybris / Joists 100mm / Vapour Control Layer	19.44	208.4	2 257.2	13.90	0.00	0.00	No
5. Vapour Control Layer / Plasterboard, skimmed finish	19.44	1 285.2	2 257.6	10.69	0.00	0.00	No
6. Plasterboard, skimmed finish / Internal surface	19.69	1 285.3	2 292.3	10.69	0.00	0.00	No
Internal surface	20.00	1 285.3	2 292.3	10.69	0.00	0.00	No



Interface temperature / Dew point graphical representation:





PF23:
T|mber 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:

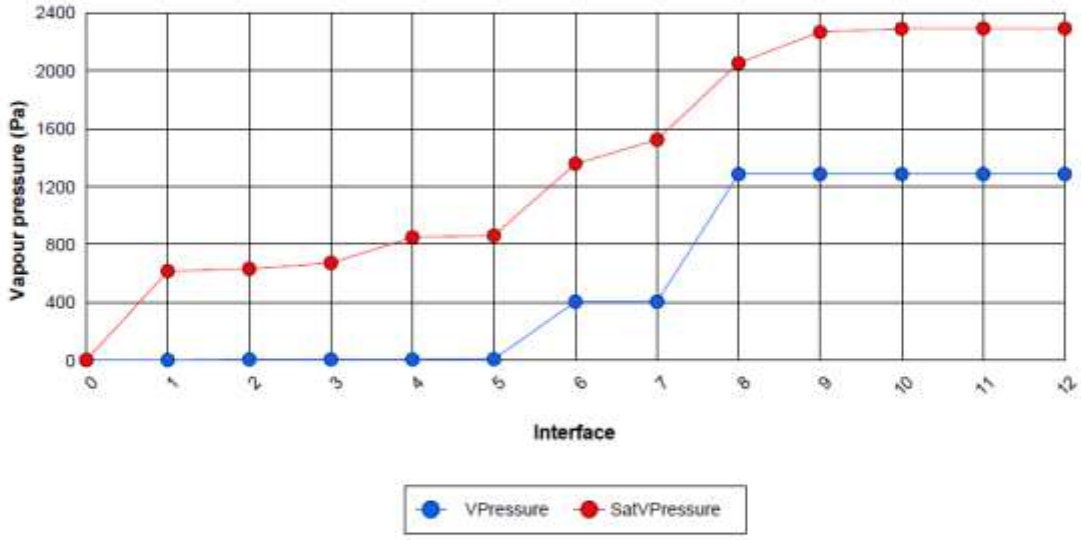
External conditions:	Temperature: 0 °C	Relative Humidity: 95 %
Internal conditions:	Temperature: 20 °C	Relative Humidity: 55 %

Table of layers:

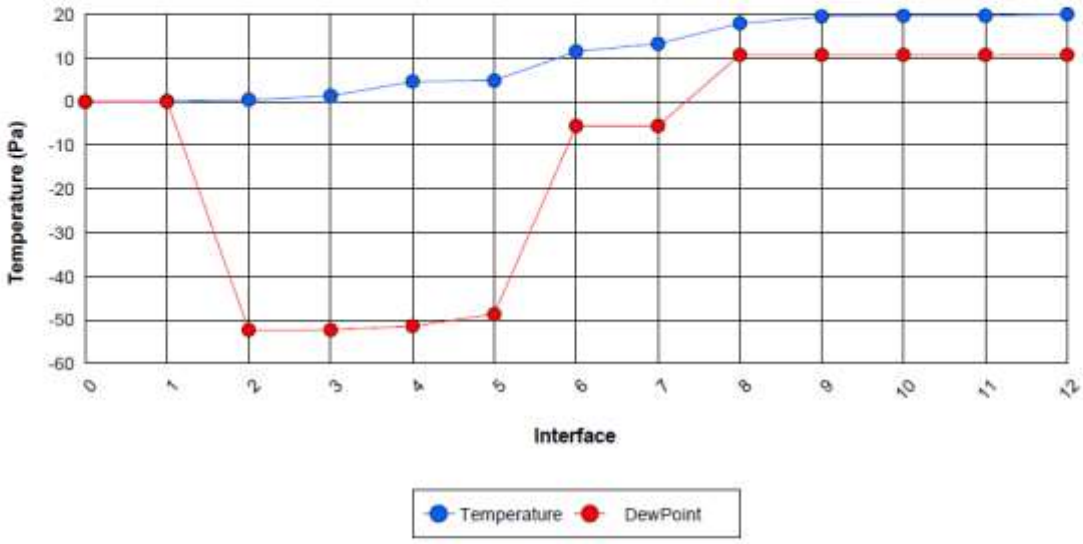
Layer	Width mm	Thermal conduct. W/m.K	Thermal resistance m2.K/W	Cumulative thermal resistance m2.K/W	Vapour resistivity GN.s/kg.m	Vapour resistance GN.s/kg	Cumulative vapour resistance GN.s/kg
External surface	-	0.000	0.040	0.040	0.000	0.000	0.00
1. Brick, outer leaf	105.0	0.770	0.136	0.176	50.0	5.25	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

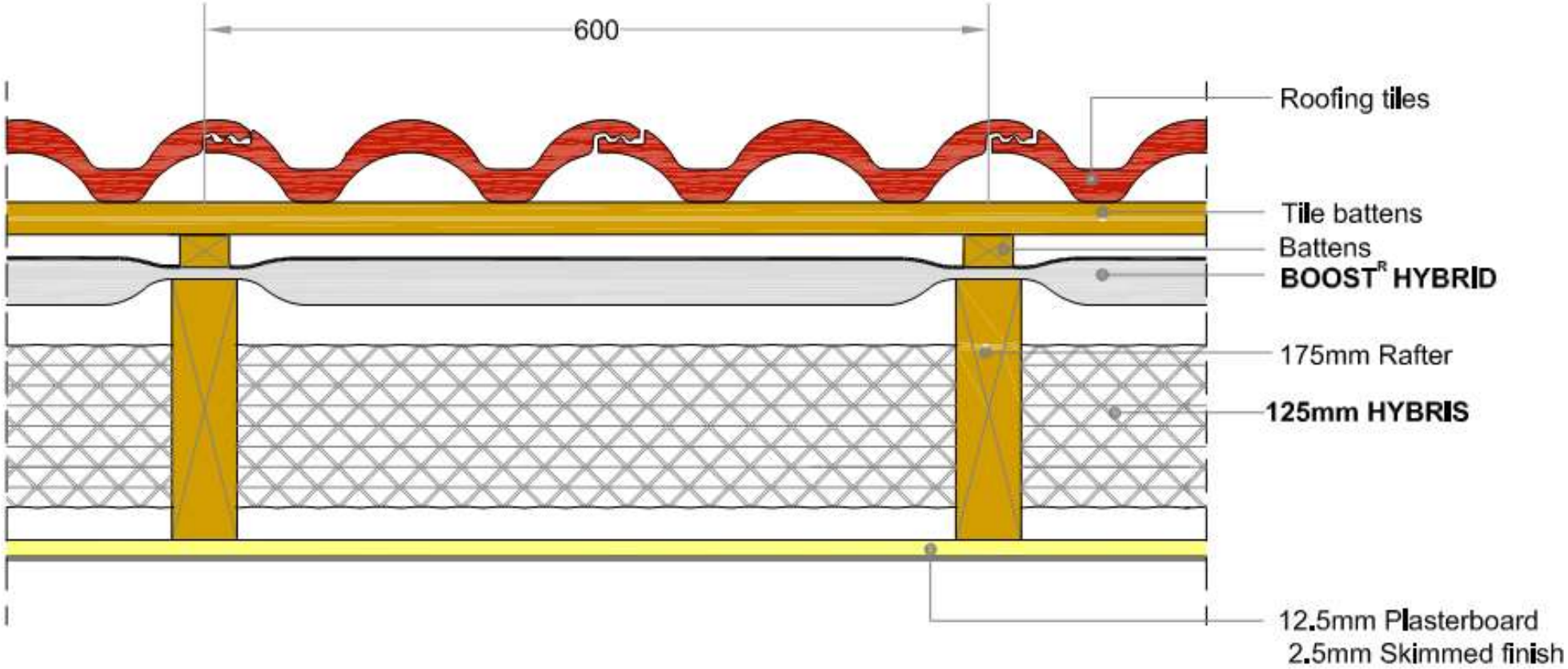
Vapour pressure table:

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:





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:

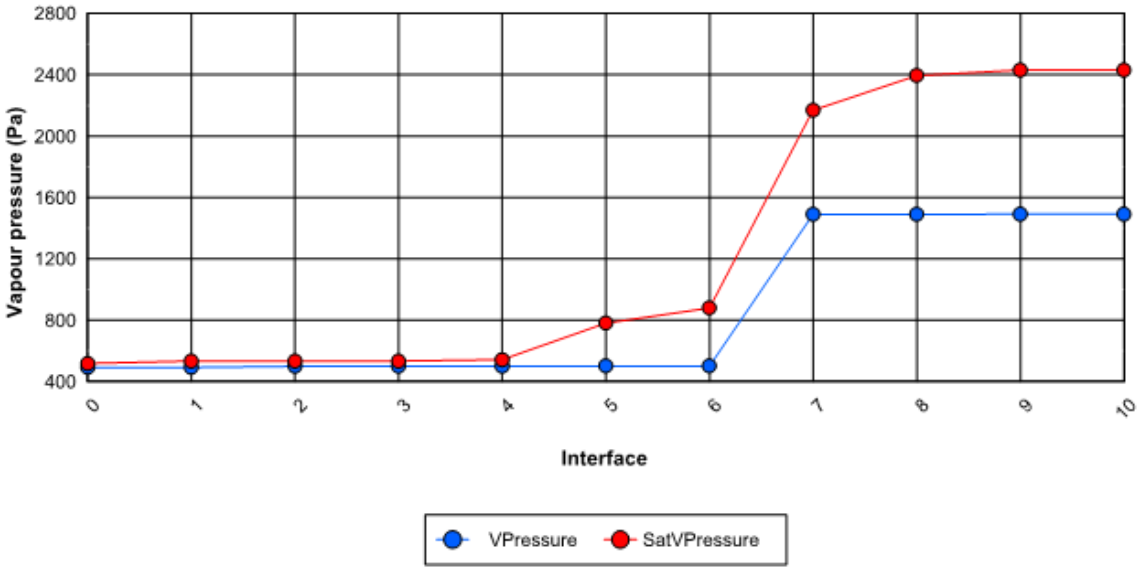
External conditions:	Temperature: -2 °C	Relative Humidity: 95 %
Internal conditions:	Temperature: 21 °C	Relative Humidity: 60 %

Table of layers:

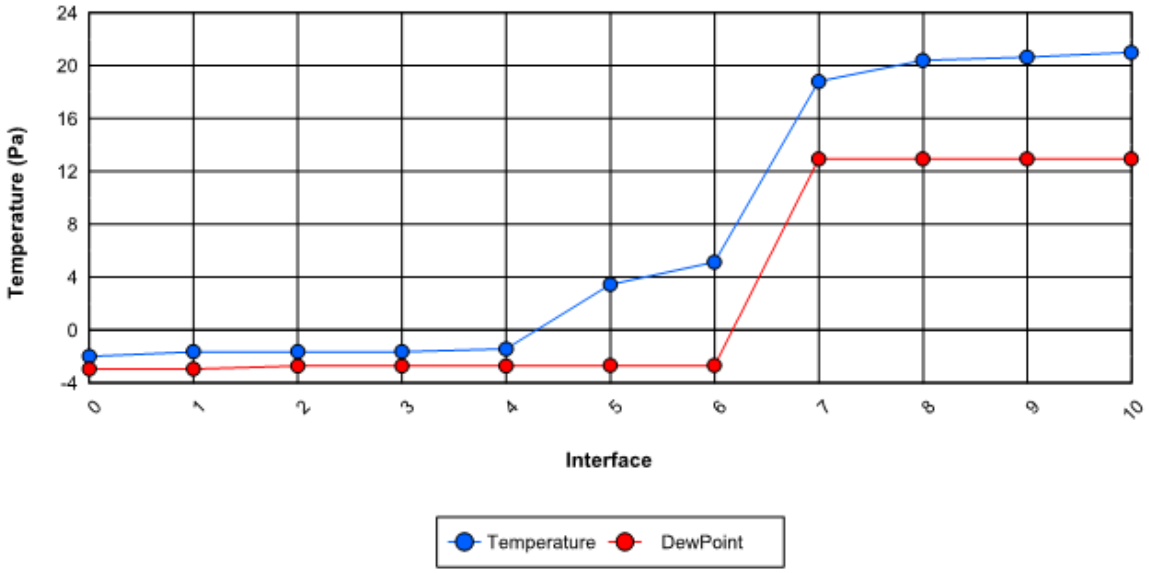
Layer	Width mm	Thermal conduct. W/m.K	Thermal resistance m2.K/W	Cumulative thermal resistance m2.K/W	Vapour resistivity GN.s/kg.m	Vapour resistance GN.s/kg	Cumulative vapour resistance GN.s/kg
External surface	-	0.000	0.100	0.100	0.000	0.000	0.00
1. Tiling, clay	15.0	1.000	0.000	0.100	250.0	3.75	3.75
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

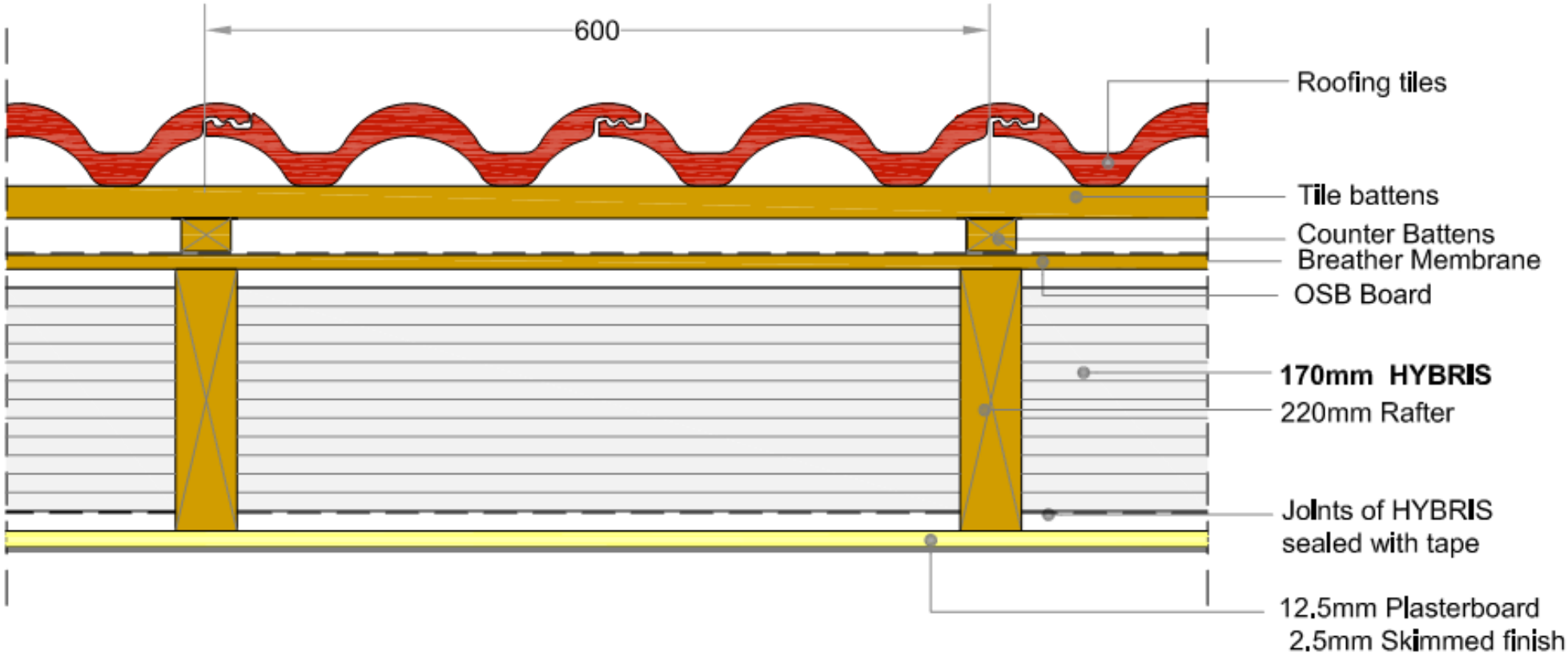
Vapour pressure table:

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:





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:

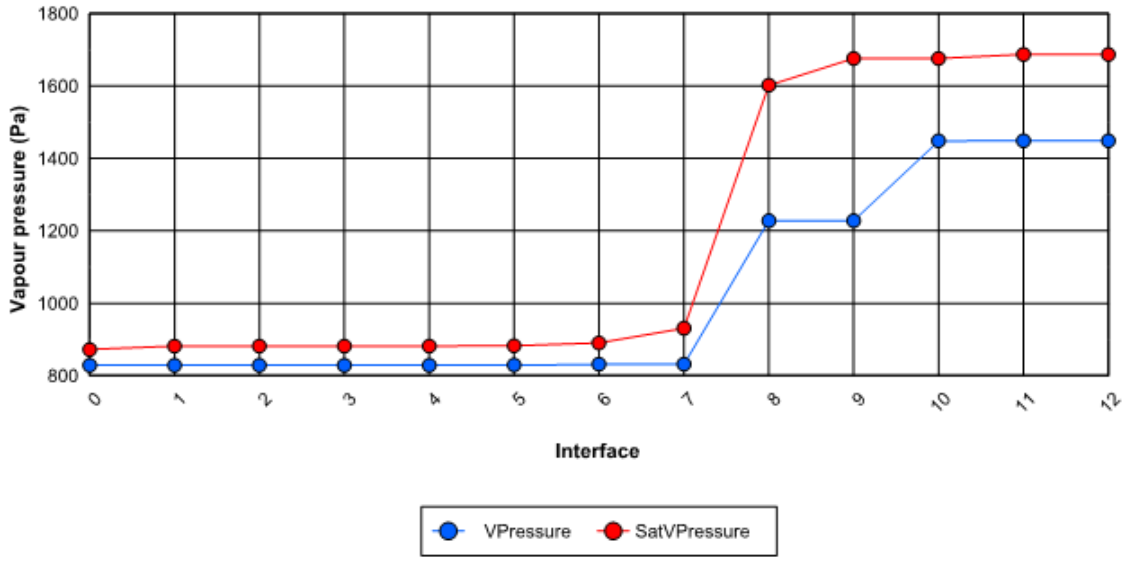
External conditions:	Temperature: 5 °C	Relative Humidity: 95 %
Internal conditions:	Temperature: 15 °C	Relative Humidity: 85 %

Table of layers:

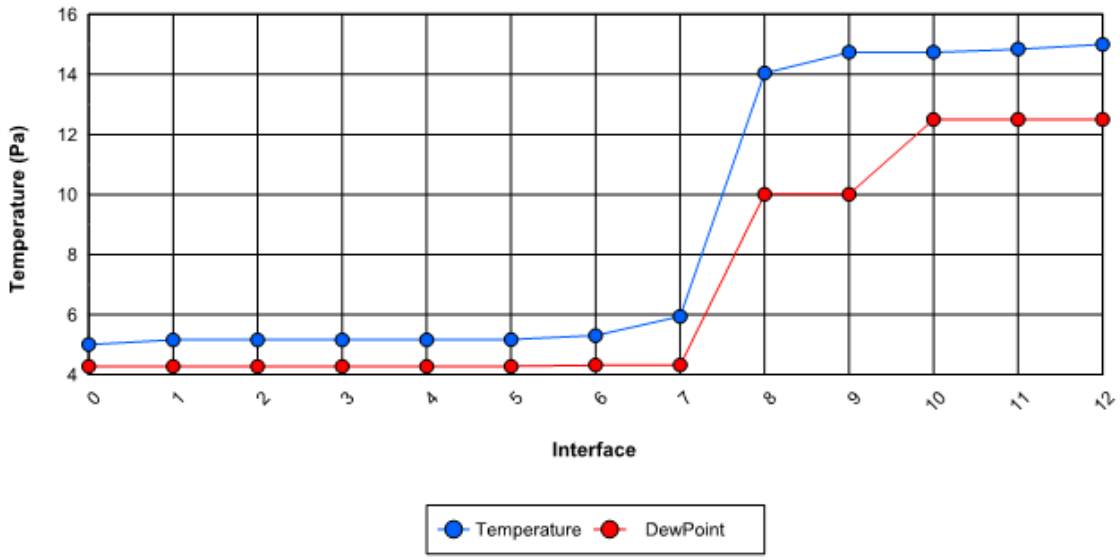
Layer	Width mm	Thermal conduct. W/m.K	Thermal resistance m2.K/W	Cumulative thermal resistance m2.K/W	Vapour resistivity GN.s/kg.m	Vapour resistance GN.s/kg	Cumulative vapour resistance GN.s/kg
External surface	-	0.000	0.100	0.100	0.000	0.000	0.00
1. Tiling, concrete	15.0	1.500	0.000	0.100	0.000	0.000	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

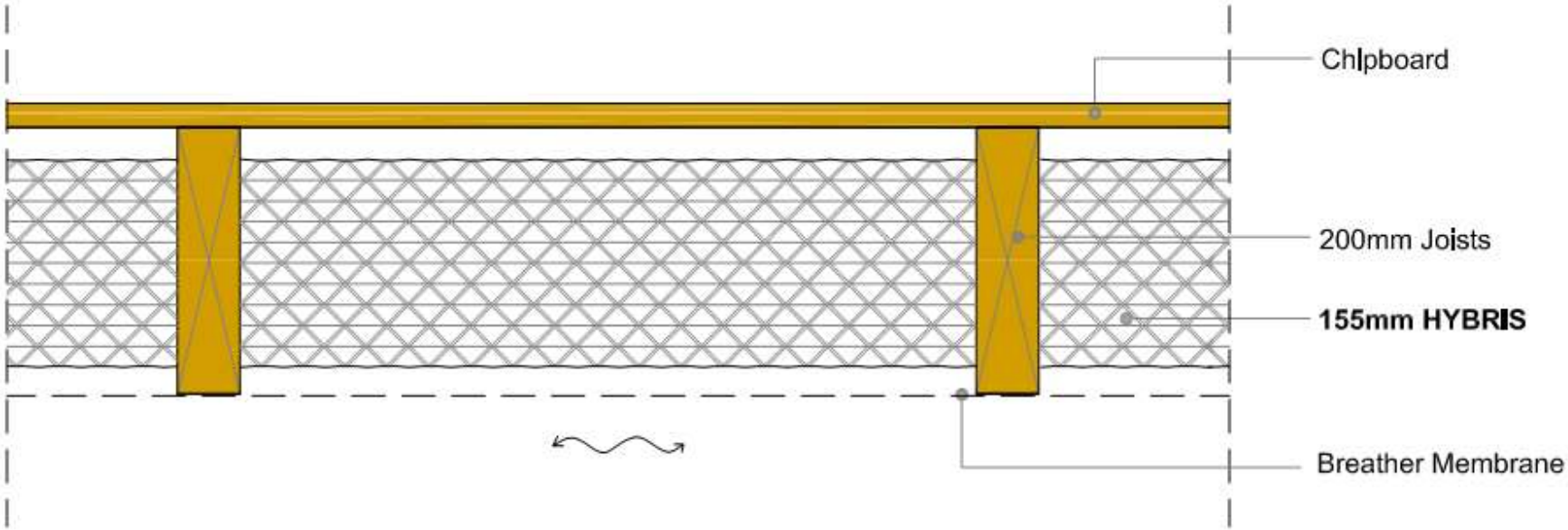
Vapour pressure table:

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:





PF101:
Suspended Timber Floor
U-value = 0.16 W/m²K

CONDENSATION RISK ANALYSIS

Users Ref: 00 PATHFINDER 2017

Issued on: 7.December.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

Floor PF101 - f-ts 155h @400c = 0.16

Environmental conditions:

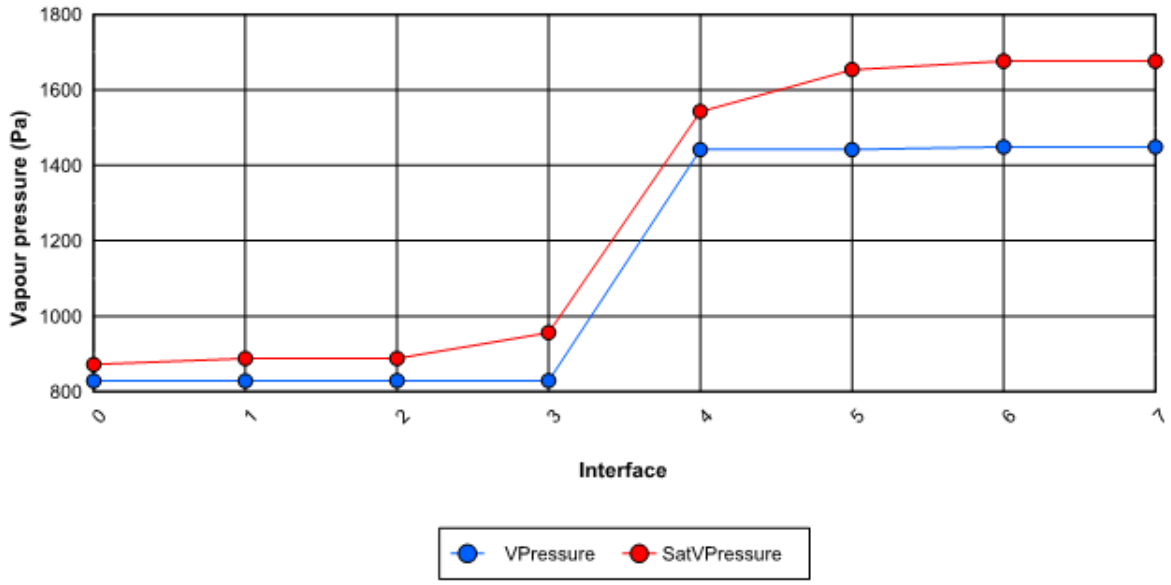
External conditions:	Temperature: 5 °C	Relative Humidity: 95 %
Internal conditions:	Temperature: 15 °C	Relative Humidity: 85 %

Table of layers:

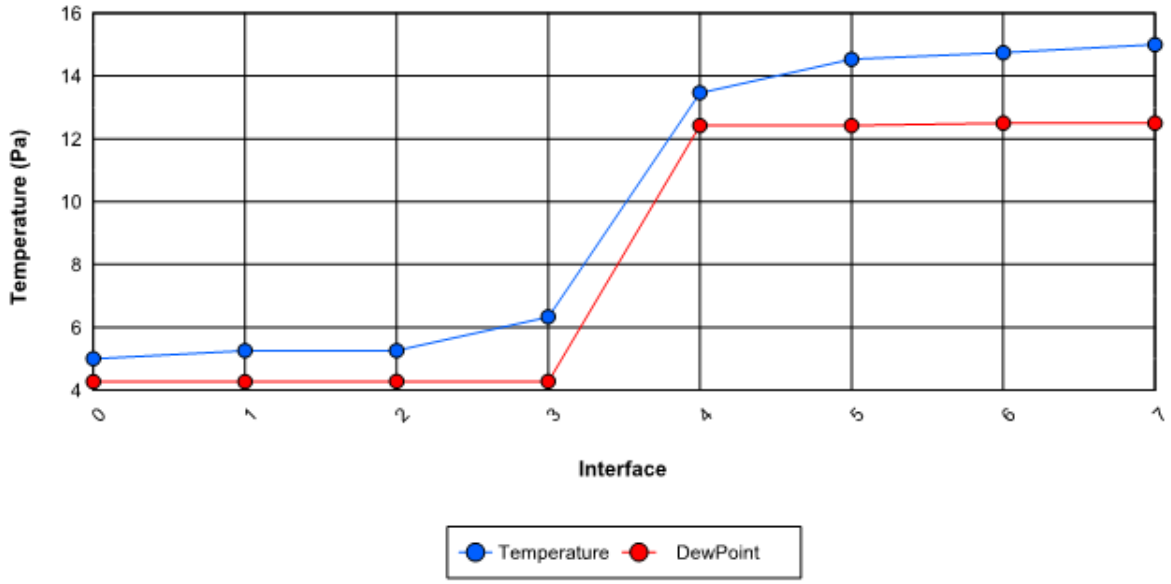
Layer	Width mm	Thermal conduct. W/m.K	Thermal resistance m2.K/W	Cumulative thermal resistance m2.K/W	Vapour resistivity GN.s/kg.m	Vapour resistance GN.s/kg	Cumulative vapour resistance GN.s/kg
External surface	-	0.000	0.170	0.170	0.000	0.000	0.00
1. Breather membrane	0.4	0.500	0.001	0.171	0.000	0.40	0.40
2. Hybris - Associated Air Gap	22.5	0.000	0.705	0.876	0.000	0.000	0.40
3. Hybris	155.0	0.033	4.697	5.573	0.000	450.00	450.40
4. Hybris - Associated Air Gap	22.5	0.000	0.705	6.278	0.000	0.000	450.40
5. Chipboard	18.0	0.130	0.138	6.416	300.0	5.40	455.80
Internal surface	-	0.000	0.170	6.416	0.000	0.000	455.80

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 / Breather membrane	5.26	828.3	887.7	4.27	0.00	0.00	No
2. Breather membrane / Hybris - Associated Air Gap	5.26	828.8	887.8	4.28	0.00	0.00	No
3. Hybris - Associated Air Gap / Hybris	6.33	828.8	956.2	4.28	0.00	0.00	No
4. Hybris / Hybris - Associated Air Gap	13.46	1 441.4	1 542.7	12.42	0.00	0.00	No
5. Hybris - Associated Air Gap / Chipboard	14.53	1 441.4	1 653.7	12.42	0.00	0.00	No
6. Chipboard / Internal surface	14.74	1 448.7	1 676.3	12.50	0.00	0.00	No
Internal surface	15.00	1 448.7	1 676.3	12.50	0.00	0.00	No



Interface temperature / Dew point graphical representation:



UVALUE CALCULATION

Users Ref: 00 PATHFINDER 2017 **Issued on:** 7.December.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 Floor PF101 - f-ts 155h @400c = 0.16

Floor Type: Suspended
Area = 85.90 m², Perimeter = 42.95 m, Wall thickness = 257 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	λ	R	Fraction
External surface				0.170	
Layer1	**Breather membrane**				
	Main construction	0 mm	0.500	0.001	100.00 %
Layer2	**Hybris - Associated Air Gap**				
	Main construction	23 mm	0.032	0.705	88.25 %
	Bridging - Timber	23 mm	0.130	0.000	11.75 %
Layer3	**Hybris**				
	Main construction	155 mm	0.033	4.697	88.25 %
	Corrections - Air Gap: Level 0, Fasteners: None or plastic				
	Bridging - Timber	155 mm	0.130	0.000	11.75 %
Layer4	**Hybris - Associated Air Gap**				
	Main construction	23 mm	0.032	0.705	88.25 %
	Bridging - Timber	23 mm	0.130	0.000	11.75 %
Layer5	**Chipboard**				
	Main construction	18 mm	0.130	0.138	100.00 %
Internal surface				0.170	

Total resistance: Upper limit = 5.655 m²K/W Lower limit = 5.006 m²K/W Average = 5.331 m²K/W
U-value (unrounded) = 0.1876 W/m²K

Suspended floor corrections:
B' = 4.0000

Total thickness: 218 mm **U-value: 0.16 W/m²K**