

## Q-Mark Registration Schedule

Honeycomb Insulation

Hybris

ACTIS SA 30 Avenue de Catalogne 11300 Limoux France



This Q-Mark Schedule is issued in accordance with our Terms and Conditions. a copy of which is available on request. The Legal Validity of the document can only be claimed on the presentation of the complete Document/Report.



Q-Mark Registration Schedule			
Holder of Q-N	lark	ACTIS SA	
Product Name	9	Hybris	
Type and Use	of Product	Intended for use as Insulation in Roofs, Walls and Floors	
Validity	From	01/07/2022	
valiaity.	То	03/03/2025	
Date of This Is	ssue	01/07/2022	
Issue Number	r	6	
This Issue Re	places	Revision 5, 04/03/2022	
Relates to Ce	rtificate Number	BIPS-0106	
Manufacturing Address/s		30 Avenue de Catalogne 11300 Limoux France	
This Schedule	e Contains	48 Pages, including 3 Annexes	

EXOV

Contents	<u>Page</u>
1 INTRODUCTION	6
2 DEFINITIONS & ABBREVIATIONS	6
3 SCOPE	6
4PRODUCT DESCRIPTION4.1General4.2Intended Use	<b>6</b> 6 7
5 BUILDING CONTROL AND OTHER THIRD PARTIES	7
6SCHEME REQUIREMENTS6.1Quality Management System (QMS)6.2Documentation6.2.1Manufacturing Documentation	<b>7</b> 8 8 8
7MINIMUM QMS REQUIREMENTS7.1Factory Production Control7.2Management Responsibility7.3Company Representative7.4Internal Audits7.5Documentation7.6Work Instructions7.7Procedures for Non-Conforming Product7.8Traceability7.9Training7.10Complaints7.11Document Control7.12Machinery Maintenance and Calibration	8 8 8 8 9 9 9 9 9 9 9 9 9 9
<ul> <li>8 OTHER REQUIREMENTS OF THE SCHEME</li> <li>8.1 Product Specification/Range Documentation and Assessment</li> </ul>	<b>9</b> 9
9       TRANSPORT, STORAGE AND INSTALLATION INSTRUCTIONS         9.1       General         9.2       Transport and Storage         9.3       Installation         9.3.1       General         9.3.2       Roof/Wall Underlay and Vapour / Air Barrier Installation         9.3.3       Timber Frame Wall Installation         9.3.4       Pitched Roof Installation         9.3.5       Loft / Attic Installation         9.3.6       Floor Installation	<b>9</b> 9 10 10 10 11 12 13 14
<ul> <li>10 TEST AND VERIFICATION REQUIREMENTS</li> <li>10.1 Test Reports and Sampling</li> <li>10.2 Initial Type Testing</li> <li>10.2.1 Mechanical Resistance and Stability</li> <li>10.2.2 Safety in Case of Fire</li> <li>10.2.3 Hygiene, Health and Environment</li> <li>10.2.4 Safety in Use</li> <li>10.2.5 Protection against Noise</li> <li>10.2.6 Energy Economy and Heat Retention</li> <li>10.3 Aspects of Durability</li> <li>11 IDENTIFICATION AND USE OF THE BM TRADA AND Q-MARK LOGOS</li> </ul>	<b>15</b> 15 15 16 17 17 17 17 18
IT IDENTIFICATION AND USE OF THE DWITKADA AND Q-WARK LUGUS	10

	~	-	10
	л	U	V
D.M	STR	1	
100			m.

12	GUARANTEES	18
13	ANNEX 1: EVIDENCE/DOCUMENTS USED IN THIS ASSESSMENT	19
14	ANNEX 2: NORMATIVE REFERENCES	20
15	ANNEX 3: EXAMPLE U-VALUE AND CONDENSATION RISK CALCULATIONS	21



#### 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/m³)	<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 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 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.

#### 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 is comprised of the Quality Manual, Procedures, works instructions and test data.

#### 7 MINIMUM QMS REQUIREMENTS

#### 7.1 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.

#### 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 either:



- free rolls of surfaces from 2m<sup>2</sup> (300mm thick) to 14m<sup>2</sup> (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.

#### 9.3 Installation

#### 9.3.1 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.

#### 9.3.2 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.



#### 9.3.3 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.

BM TRADA

Page **11** of **48** 



- 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.

#### 9.3.4 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:



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.

#### 9.3.5 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 crosslaid 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.

### 9.3.6 Floor Installation





#### 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 in accordance with the scheme rules.

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

#### 10.2 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.

#### 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
- 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/m³)	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/m³)	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
Defere	Peel strength of tape, N/100mm	EN 11339	22 (adhesion failure)
ageing	Tensile strength parallel to faces of tape, N/100mm	EN 1608	116
After	Peel strength of tape, N/100mm	EN 11339	At 98 the HYBRIS surface is torn
ageing	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/m².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.

#### 10.2.2 Safety in Case of Fire

#### 10.2.2.1 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.

#### 10.2.2.2 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.

BM TRADA

Page **16** of **48** 

**Commented [VK1]:** We haven't received a report to justify this statement



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

#### 10.2.3 Hygiene, Health and Environment

#### 10.2.3.1 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.

#### 10.2.3.2 Release of Dangerous Substances

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

#### 10.2.4 Safety in Use

Not relevant.

#### 10.2.5 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.

#### 10.2.6 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	[m²K/W]	mm	[m²K/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	[m²K/W]	mm	[m²K/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.

### 10.3 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°C and 90% Relative Humidity. Mechanical properties were checked after ageing. For emissivity, the product was exposed to ageing in accordance with EN 16012.

#### 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.

**BM TRADA** 

Page 18 of 48



### 13 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.
- ACERMI Certificate No. 15/189/1047. Association pour la certification des materiaux isolants.



#### 14 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.
- 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.

# EXOV

## 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 Certification.

- Non-ventilated pitched roof with Hybris and HControl Hybrid
- Non-ventilated pitched roof with Hybris insulation
- Timber frame wall with Boost<sup>R</sup> Hybrid, HControl Hybrid and Hybris insulation
- Suspended Timber Floor



pertys PRating: 0 Fuel Bill: (( Energy used: 0) Veyor: . dress: ent France Promote 000 Regs Region: England and Wales, Calculation Type	Prop 1 Carbon 0.00 CO2 Kar 0 GJ per annum e: New Build	type Raf: a Index: 0.0	) tyear	
perty: P Rating: 0 Fuel Bill: (( Energy used: 0) Neyor: . dess: ent Prate Promote: 000 Regs Region: England and Wales, Calculation Type	Carbon 0.00 CO2 Ka 0 GJ per ananan e: New Build	a Index: 0.0	) tiyear	_
P Rating: 0 Fuel Bill: (( Energy used: 0) Network: detex: call Potence: 000 Regs Region: England and Wales, Calculation Type Potence: 000 Regs Region: England and Wales, Calculation Type	0.00 CO2 Ka 0 GJ per ananan e New Build	distions: 0.00	) t'year	
P Rating: 0 Fuel Bill: (( Energy used: 0) Areas: call Potence: 000 Regs Region: England and Wales, Calculation Type Potence: 000 Regs Region: England and Wales, Calculation Type	e New Build	disions: 0.00	) t'year	
Energy used: (); Veyor: . dress: enti- Tware Promotion: 0.00 Rogs Region: England and Wales, Calculation Type Promotion: 0.00 Rogs Region: 0.00	0 GJ per annun r. New Build			
veyor . dress: ent fware Proreios: 0.00 Rogs Region: England and Wales, Calculation Type Proreios: 0.00 Rogs Region: England and Wales, Calculation Type	e New Build			
Prentiere Premion: 0.00 Regs Region: England and Wales, Calculation Type	e New Build			
Promision: 0.00 Regs Region: England and Wales, Calculation Type	e New Build			
CUBROB ERENOL: DO EN 150 0940, DO EN 150 15570, DO 5250				
ubling Elements				
alding Liement Rood PF31 - r-rp BCB+B99-0.15				
oof Type: Pitched Roof, invalated sloping ceiling	D. t.		P	Eastin
External curface	13pGddeii	*	0.040	Practice
Layer1 Tilling, clay				
Main construction	15 mm	1.000	0.015	100.00 %
Layer2 Standard cavity				
Main construction	25 mm	0.313	0.080	\$7.33 %
Budena - Timbr	25 mm	0.130	0.000	12.67%
Layer3 Breather membrane				
Main construction	0 mm	0.500	0.000	100.00 %
Layer4 Hybris - Associated Air Gap / Rafter 148mm				
Main construction	15 mm	0.037	0.407	92.17%
Bridging - Timber	15 mm	0.130	0.000	7.83 %
Layer5 Bybris / Rafter 140mm				
Main construction	90 mm	0.033	2.727	92.17%
Corrections - Air Gap: Level 0, Fastener Bridaina - Timber	rs: Nose or plastic	0.135	0.000	7 83 %
Lavers Hybrit - Associated Air Gap / Rafter 148mm	Po taka	0.120	0.000	1.40 14
Main construction	15 mm	0.032	0.434	92.17%
Bridging - Timber	15 mm	0.130	0.000	7.83 %
Layer? BControl Hybrid				
Make construction	45 mm	0.024	1,900	93.67%
Bridging - Timber	45 mm	0.130	0.000	6.33 %
Layers BControl Hybrid - Associated Air Gap / Batten Stu				
Main construction	11 mm	0.028	0.355	95.67%
Bridging - Timber	11 mm	0.130	0.000	6.33 %
Layer9 Plasterboard			0.000	
Mann constructions	1.3 mm	0.190	0.006	500.00 %
Layer10 Plaster, skim				
Main construction	3 mm	0.400	0.005	500.00 %
Internal curface			0.100	
Total resistance: Upper limit = 5.790 m/K/W Lower limit =	SOIR W Aman -	414 m/K/W		
Uval	ice (unrounded) = 0.1547 Wit	X		
Unheated space: None				

+ Embert Europy System: Landed Registered Office Unit 16, 5t Marc Business Park, Laterworth, Laurentechier LE17 483.

BM TRADA

Page **19** of **48** 

	CONDENS	ATION	RISK	ANALYSIS
--	---------	-------	------	----------

Users Ref: 00 PATHFINDER 2016 (PANELS)

Issued on:	17.November 2016
Prop Type Rof:	
Carbon lades:	0.0

Page 1

Property:

SAP Rating: 0

Fuel Bill: £0.00 Energy used: 0.0 GJ per annum CO2 Eminient: 0.00 t/year

Sarregor: , Address: Chest: Software SAP version: 0.00 Reps Region: England and Woles, Coloulation Type: New Build Coloulation method: BS EN ISO 6946, BS EN ISO 13370, BS 5250 Coloulation method: BS EN ISO 6946, BS EN ISO 13370, BS 5250 Read PF31 - r-tp HCH+R00=8.18

Extensil couditions:	Temperature: 0 *C	Relative Bunnidity: 95 %
Internal conditions:	Temperature: 20 °C	Relative Bunnidity, 55 %

Layer	Width	Themal conduct Wm.K	Thermal resistance ml.E.W	Cumulative thermal pesistence m2X/W	Vapour resistivity GS:skgm	Unpour pesistance GNA hp	Cumularive vapour senistance GX.skg
Internal variace		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 centity	25.0	0.000	0.050	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 Gup / Rather 140mm	15.0	0.000	0.407	0.543	0.000	0.000	4.15
5. Hybris / Rather 140mm	90.0	0.033	2.727	3.270	0.000	450.00	454.15
6. Hybris - Associated Air Gop / Rather 140mm	15.0	0.000	0.474	3.344	0.000	0.000	454.15
7. HCourol Hybrid	45.0	0.000	1.900	5.644	0.000	1,000.00	1,454.15
8. HControl Hybrid - Associated Air Osp / Barter	11.0	0.000	0.388	6.652	0.000	0.000	1,454.15
9. Planterboard	12.5	0.190	0.066	6.095	45.0	0.56	1,454.71
10. Plaster, skim	2.5	0.400	0.006	6.104	60.0	0.15	1,454.06
Internal surface		0.000	0.100	6.104	0.000	0.000	1,454,88

o Eladore Energy System Limited Regiment Office Tel: 16, 50 Nian Donison Pail, Lonework, Lanorenskie LE17-603

BM TRADA

Page **20** of **48** 

Interface - between levers	Interface	Vapour	Same	Dett'	Cond.	Cond	Cond.
	temp.	pressure	vapour	point	1958	rate.	risk
			pressure		-	60 days	
					A and a	1.000	10
External surface	0.00	0.0	0.0	0.00	0.00	0.00	N
1. External variace / Tiling, clay	0.13	0.0	636.3	0.00	0.00	0.00	Ne
2. Titing, clay / Standard cavity	0.18	3.3	618.4	55.05	0.00	0.00	Ne
3. Standard cavity / Breather membrane	0.44	3.3	630.1	55.05	0.00	0.00	Ne
4. Breather membrane / Hybris - Associated Air Gop / Rather 140mm	0.44	3.7	630.2	54.23	0.00	0.00	Ne
5. Elybris - Associated Air Gep / Bather 140mm / Elybris / Rather 140mm	1.75	3.7	6P2.5	54.23	0.00	0.00	Ne
6. Hybris / Rafter 140mm / Hybris - Associated Air Gap / Rafter 140mm	10.54	401.2	1 272.6	-5.63	0.00	0.00	Ne
7. Hybris - Associated Air Gep / Rafter 140uun / HCoatrol Hybrid	12.07	401.2	1408.3	-5.63	0.00	0.00	Ne
8. BCouttol Hybrid / BCouttol Hybrid - Associated Air Gep / Batten 50	man 18.19	1 284.7	2 068 2	10,68	0,00	0.00	Ne
9. BCoutrol Hybrid - Associated Air Osp / Batten 50mm / Plasterboard	19.45	1284.7	2 257.9	10.68	0.00	0.00	Ne
10. Planterboard / Planter, skim	19.66	1 285.2	2 287.9	10.69	0.00	0.00	Ne
11. Plaster, skim / Internal surface	19.68	1 285.3	2 290.7	10.6P	0.90	0.00	Ne
Internal cardiare	20.00	1285.3	2 299.7	10.68	0.00	0.00	Ne



6 Emirer Energy System Limited Regiment Office Unit 14, 9 Johns Brainers Park, Lamowerth, Leisenerskin LE17 498



Relates to Certificate number BIPS-0106, Revision 12/04/2017



PF37; Roof with insulation at celling level U-value = 0.16 W/m<sup>2</sup>K

© BM TRADA Certification Limited Relates to Certificate number BIPS-0106, Revision 12/04/2017

Page **27** of **48** 

#### UVALUE CALCULATION

Users Ref: 00 PATHFINDER 2014-09

lowerd on: 15.September 2014 Prop Type Ref: Carbon Index: 0.0

Ford Bill: £0.00 Energy week: 0.0 GJ per anntan CO2 Emissions: 0.00 t/year SAP Rating: 0

Property:

Surveyor: , Address: Closel Software Software Saftware Calculation method: 85 EN ISO 6946, 85 EN ISO 13370, 85 5250

of Type: P	schod Roof, unsulated sloping criling				
Lava	Description	Thuckness		R	Fraction
External	arface			0.040	
Laperl	Loft space - Tiled roof with felt				
	Main construction	1,000 mm	3.333	0.300	990,00 *
Laper2	Byhris				
	Mass construction	105 mm.	0.033	8.182	300.00 *
	Connections - Air Gap: Level 0, Fasteners: None or pla	wiel .			
Laper3	Hybrin / John 100mm				
	Main construction	90 aug	0.033	2.727	93.20 1
	Contections - Air Gap: Level 0, Fasteners: None or pla	utio .			
	Beidging - Timber	90 mm	0.130	0.000	6.80 *
Laper4	Vapour Control Loyer				
	Main construction	9 mm	0.500	0.001	300.00 1
Lapars	Placterbuard, thimmed finish				
	Main construction	15 mm	0.190	0.079	000.00 f
Internal o	artice			0.100	
Total cesi	dance: Upper limit = 6.233 m/K/W Lower limit = 5.975 m/K/W	Arenge = 0	104 = K/W		
	U-value (unrounded)	= 0.1638 Wite	/K		

0 Endowr Energy System Landed Reported Office Unit 16, 31 Islan Brunes Park, Latwoork, Lecontechae 1317 403

BM TRADA

Page **28** of **48** 

Users Ref: 00 PA	es Ref: 00 PATHFINDER 2014-09				Inned on: 17.November.2016 Prop.Type Ref: Carbon Laden: 0.0				
AP Rating: 0	Б	Fael	1820 £000	0 GJ per ann	CO: Em	ininev 0.0	о букае		
terreyon , Adress: Sent offware AP services (L 00 Regs R Mculation method: D5 I	irgion: England and Wales, C. N ISO 6946, BS EN ISO 1337	dentas	ion Type 3 5250	New Build				_	
Roof PE37 - r-tr 9011+1	95H ≨606c ≈0.16								
Environmental condition	e								
External conditions	Temperature 0 °C	-	2.440		MAK.				
Street States of States States			KALADI I	e Hunndrity, S	10.18				
Internal conditions:	Temperature 30 °C	_	Relativ	e Humidity: 5 e Humidity: 5	53.55				
Internal conditions:	Temperature: 20 °C	_	Relativ	e Humidity: 5 e Humidity: 5	55 % 55 %				
lateral conditions: Table of layers: Layer	Temperature: 20 °C	idă (	Relativ Relativ Theunal conduct. WmK	* Hamiday: 5 * Hamiday: 5 Thermal projetance m2.6/W	Cumulative thermal resetunce a2.5/W	Vapour resistivity GN vitg m	Vapour resistance OX-stg	Cumshtiv Tapou sesistanc GN-sk	
Internal conditions: Table of layers: Layer Exercised surface	Temperature: 20 °C	nan	Relativ Relativ Theunal conduct. Wm.K	+ Humiday: 5 + Humiday: 5 Themail origination m2K/W 0.040	Consulative formal resultance a2.5.W	Vapour resistivity OX sitg m	Vapour resistance 0X-stg 0.000	Cumsleiv Tapoa Steintane GN vit	
Instant conditions: Table of legers: Layer Exercuted worffice 1. Left space - Tifed soc	Temperature: 20 °C	idtà ( mm	Relativ Relativ Theunal conduct. Wm.K 0.000 3.333	* Humiday: 5 * Humiday: 5 Themail oreistance m2K/W 0.040 0.300	Cumulative disrand resentance a2%W 0.040 0.340	Tapout Insistivity ON vkg m 0.000 0.000	Vapour resistance 0.000 0.000	Cumsletiv vapos sesiotas: 08.48 0.0	
Internal conditions: Table of layers: Layer Enternal worker 1. Lath space - Tabel one 2. Hybras	Temperature: 20 °C	- 10.0	Relativ Relativ Theemail conduct. Wm.K 0.000 3.333 0.033	* Humday, 5 * Humday, 5 Themat orsistance n2.6/W 0.040 0.300 3.182	Cumulative discust meetinge a28.W 0.040 0.340 3.522	Tapout sesistivity GN vig m 0.000 0.000 0.000	Vapour resistance 0.000 0.000 450.00	Cumslativ vapou steintase GNAR 0.0 0.0 450.0	
lanemal conditions: Table of layer: Layer External surface 1. Left space - Tiled soc 2. Hybes 3. Hybes / Jona's 100ms	Temperature: 20 °C Wi Fwith first 1.00 10 10 10 10 10 10 10 10 10 10 10 10 1	- 10.0 10.0	Relativ           Relativ           Thermal conduct.           Wm.K           0.000           3.333           0.033	* Humdry 5 * Humdry 5 Themal oscitance m2.6/W 0.040 0.300 3.182 2.727	Cumulative discuss mastesce a2.8.W 0.040 0.340 0.340 0.352 6.249	Tapout Insistivity 005 vkg m 0.000 0.000 0.000 0.000	Vaposa resistance 0.000 0.000 450.00 450.00	Cumulative Tapeo stricture OK 18 0.0 0.0 450.0 900.0	
Internal conditions: Table of layers: Layer External surface 1. Left space - Tiled soc 2. Hybras / Jacob 100aus 4. Wapner Control Layer	Temperature: 20 °C	- - - - - - - - - - - - - - - - - - -	Relative Relative Umark 0.000 3.333 0.033 0.033 0.500	* Humday 5 * Humiday 5 Themail orisistance m2.6/W 0.040 0.300 3.182 2.727 0.061	Cumulative discust mastance a2.8.W 0.040 0.340 0.340 0.340 0.352 6.250	Tapoar anianyny 005.stg.m 0.000 0.000 0.000 0.000	Vaposa resistance 0.000 0.000 4.000 4.000 4.000 4.000	Cuanditativ Tapos etrainanc 05 x8 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	
Internal conditions: Table of layers: Layer External surface 1. Left space - Tifel soc 2. Hybras / Jonata 100aan 4. Wypour Control Layer 5. Planterboard, skinnar	Temperature: 20 °C		Retails Retails Wm.K 0.000 3.333 0.033 0.033 0.500 0.190	* Handdy 's * Handdy 's Themal originates n25/W 0.040 0.300 3.112 2.727 0.004 0.079	Cumulative disrand mastesce a2.60 0.340 0.340 0.340 0.340 0.352 6.250 6.329	Vapoar anianvity 05.vkg.m 0.000 0.000 0.000 0.000 0.000 45.0	Vaposi Insistance 00.54g 0.000 450.00 450.00 4.60.00 0.68	Cumulativ Tapoa senistanc 05x8 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	

6 Elabord Earsy System Limited Registered Office Unit 36.51 State Brokers Park, Laterworth, Leoreneodus LET? 488

BM TRADA

Page **29** of **48** 



Page **30** of **48** 



TINES I	110.4	CALC	1000	TTON
UVAL	ALC: N			110.4

Users Ref: 00 PATHFINDER 2014-09

hundon: 17.November 2016 Prop Type Ref. Carbon Index: 0.0

CO2 Emissions: 0.00 Uyear

SAP Rating: 0 Fael Bill: £0.00 Energy used: 0.0 GJ per annum

Surveyor. Address:

Property:

Client Chent Schware SAP version: 0.00 Reps Region: England and Wales, Calculation Type: New Build Calculation method: BS EN ISO 6046, BS EN ISO 13570, BS 5250

Layer	Description	Thickness	2	2.	Fractio
External	arface			0.640	
Layer1	Brick, outer leaf				
	Main construction	305 mm	0.770	0.136	\$2.83
	Bridging - Mortae	105 mm	0.941	0.000	17.19
Laper2	Air Gap vented, e=0.31				
	Main construction	50 mm	0.140	0.358	100.00
Layer5	BoostR Hybrid				
	Main construction	35 mm	0.026	1.350	100.00
Laser4	OSB				
	Main construction	11 mars	0.130	0.085	100.00
Layer5	Bybris / Stud 140mm				
	Main construction	90 mara	0.033	2.727	\$5.00
	Convections - Air Gap: Level 0, Fasteners: Nune or	plavise			
	Bridging - Timber	90 mm	0.130	0.000	15.00
Layer6	Hybris - Associated Air Gap / Stud 140mm				
	Main construction	28 mm	0.035	0.717	\$5.00
	Bridging - Timber	28 mm	0.130	0.000	15.00
Layer7	IBControl Hybrid				
	Main construction	45 mm	0.024	1,900	90.50
	Bridging - Tember	45 mm	0.130	0.000	9.50
LayerS	IlControl Hybrid - Associated AirGap / Batten Mann				
	Main construction	20 mm	0.031	0.650	90.50
	Bridging - Tunber	20 mm	0.130	0.000	9.50
Layne9	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 o	urface			0.130	
Tatal reti	tance: Upper limit = 7.456 m/K/W Lower limit = 6.416 m/K	W Average =	5.936 m/K/W	9	
_	U-value (unround	ed) = 0.1442 W/s	a/K		

© Eindnest Energy System Limited Regiment Office Unit 16. St Johns Breiners Park, Lutterworth, Leicesterhite LE17 400

BM TRADA

Page **28** of **48** 

CUMPENSATION KISK ADALISIS	CC	NDEN	SATION	RISK /	ANALYSI	s
----------------------------	----	------	--------	--------	---------	---

Users Ref: 00 PATHFINDER 2014-09

1000		-		
200			••	
	-	-	~	

Issued on: 17.November 2016 Prop Type Rat: Carbon Index: 0.0

Page 1

SAP Rating: 0

CO2 Emissions: 0.00 t/year Fuel Bill: £0.00 Energy used: 0.0 GJ per annum

Surveyor Address

Address Client Software SAP revuoe: 0.00 Regs Region: England and Wales, Calculation Type: New Build Calculation method: BS EN ISO 6946, BS EN ISO 13570, BS 5250 Control of BCH+90H+BRH @600e=0.14

**Environmental** condition External conditions: Temperature: 0 °C Relative Humshity: 95 % Internal conditions: Temperature: 20 °C Relative Humiday: 55 %

Table of Ispers:							
Leyer		Thermal conduct. Wm.K	Themal resistance sol KW	Cumulative thermal resistance s2.X.W	Vepeur orsistity ON shpm	Vapour resistance ON sky	Consolative vapour proistance GN sTg
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. BeauR Hybrid	35.0	0.000	1,350	1.884	0.000	0.60	5.85
4.058	11.0	0.130	0.053	1.969	200.0	2.20	8.05
5. Bybeis / Stud 140mm	90.0	0.033	2.727	4.696	0.000	450.00	458.05
6. Bybris - Associated Air Gap./ Stud 140mm	27.5	0.000	0.717	5.413	0.000	0.000	458.05
7. SCentral Hybrid	45.0	0.000	1,900	7.313	0.000	1,000.00	1,458.05
8. ECoutrol Hybrid - Associated AirGap / Batten	20.0	0.000	0.650	7.963	0.000	0.000	1,458.05
9. Plastecheard	12.5	0.190	0.056	8.029	40.0	0.50	1,458.55
10. Plaster, skim	2.5	0.400	0.006	\$.035	60.0	0.15	1,458.70
Internal surface		0.000	0.130	8.035	0.000	0.000	1,458.70

6 Elminert Energy Systems Limited Registered Office Unit 16, 31 Julius Basiness Park, Lasterworth, Leicentershare LE17 4828

BM TRADA

Page **29** of **48** 

Vapour prevoure table:									
laterface - between layers	Interface temp. *C	Vapour pressare Pa	Satur vapour pressure Po	Dew point	Cond. rate gui25	Cond. Inte 60 days gm23	Coad risk Y.S		
Extended surface	0.00	0.0	0.0	0.00	0.00	0.00	Ne		
1 External surface / Brick, outer leaf	0.10	0.0	614.9	0.00	0.00	0.00	Ne		
2. Brick, outer leaf / Air Gap vested, e=0.31	0.43	4.6	630.0	52.30	0.00	0.00	Ne		
3. Air Gap vented, e=0.31 / BoostR Hybrid	1.31	4.6	671.2	52.30	0.00	0.00	No		
4. BoowR Hybrid / 058	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		
5. Hybris / Stud 140mm / Hybris - Associated Air Gap / Stud 140mm	11.50	403.6	1 356.5	-5.55	0.00	0.00	Ne		
7. Hybris - Associated Air Gap / Stud 140mm / HControl Hybrid	13,26	403.6	1 522.5	-5.55	0.00	0.00	Ne		
8. HControl Hybrid / HControl Hybrid - Associated AirGup / Batten 18	nam 17.91	1 284.8	2 051.6	10.68	0.00	0.00	Ne		
9. HControl Hybrid - Associated AirGup / Batten Hann / Plasterboard	19.51	1 284.8	2 266.3	10.68	0.00	0.00	Ne		
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	Ne		



•.....

0 Eindowst Earryy Systems Lancied Registered Office Unit 16, 51 Julius Basiness Park, Lasterworth, Lescenterdare LET? 688

BM TRADA

Page **30** of **48** 



· .	
· **	
1943 - 1	ан Талан алан алан алан алан алан алан алан

# Elminerr Energy Systems Limited Reported Officer Unit 16, 5t Adms Bensoens Pack, Lasterworth, Leisenterdaer LE17 468.

BM TRADA

Page **31** of **48** 



PF53b: Pitched roof @ 600c U-value = 0.18 W/m<sup>2</sup>K

BM TRADA

Page **28** of **48** 

#### UVALUE CALCULATION

Fuel Bill: £0.00

Energy used: 0.0 GJ per annum

Users Ref: 00 PATHFINDER 2017

Issued on: 29.September.2017 Prop Type Ref: Carbon Index: 0.0

CO2 Emissions: 0.00 Uycar

SAP Rating: 0

Property:

Surveyor: Address:

Chem: Chem: 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

ilding Eler	nent Roof PF53b - r-tp 1250+BRH @600c =0.18				
oof Type: P	thehed Roof, insulated sloping ceiling				
Layer	Description	Thickness	λ	R	Fraction
External	spriace			0.100	
Layer1	Tillug, ciay				
	Main construction	15 ann	1.1630	0,000	100.00 %
Layer2	air gap / Battens				
	Main construction	25 mm	6.220	0.000	\$9.63 %
	Corrections - Cavity Ventilated, Emissivity: Nong-	d .			
	Bridging - Timber	25 aus	0.138	0.000	16.37 %
Layer3	*Correction roof protected by wind, e=0.31				
	Main construction	25 atm	0,446	0.056	too, wu s
Layer4	Boostk Hybrid				
	Main construction	. 35 aus	0,026	1,350	· 92.17 %
	Bridging - Timber	35 aum	0.130	0.000	7.83 9
LayerS	Hybris - Associated Alr Gap / Rafter 175mm				
	Maio construction	15 mm	0.034	0.470	92,173
	Beidging - Timber	15 mm	0.130	0.000	7.83 9
Layer6	Hybris / Ralter 175mm				
	Main construction	t25 mu:	0.033	0.000	92.17 %
	Corrections - An Gop: Level 0, Fasteners: None or	plastic			
	Bridging - Timber	\$25 mm	0.130	3.788	7,83 *
Layer7	Hybris - Associated Air: Gap / Bafter 175mm				
	Main construction	15 mm	0.033	0.443	92.17 5
	Bridging - Timber	15 mm	0.130	0.000	7.83 5
LayerS	Plasterboard				
	Main construction	13 mm	0,190	0.066	100.00 5
Internal s	rarface			0.100	
Total resi	stance: Upper limit = 5.829 m/K/W Lower limit = 5.163 m/K	/W Average =	5.496 m/K/W	-	
	U-value (onrous	(ed) = 0.1819 Wit	rκ		
Unbested	space: None				
	Total thickness: 267 mm U	-value: 0.18 With	WK .		

a Einhant Energy Systems Limited Registered Office Unit 16, St Johns Basiness Park, Laterscenth, Lekestershire LE17 4818

**BM TRADA** 

Page 28 of 48

ATTACK IN THE WAR AND	A DESTROYARY TO BE	THE A DECK TRACKING
C DANKENS	ATTON RD	K ANALYSIS
ALC: NOTE THAT ALSO ALC: NO	ALL DURING THE REAL	And the state of t

Users Ref: 00 PATHFINDER 2017

Issued on: 29.September.2017 Prop Type Ref. Carbon Index: 0.0

Page: I

Property:

Fuel Bill: £0.00

CO2 Emissions: 0.00 t/year Energy used: 0.0 GJ per annum

Surveyor: , Address:

Client: Software

SAP Rating: 0

SAP versioe: 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

#### sental conditions: Eavie

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

Layer	Width	Thermal conduct. WinK	Thermal resistance n2.8.19	Cumulative thermal resistance =2.879	Vapour resistivity GNahgas	Vapour resistance GNAMP	Cumulativ vapou resistanc GNAN
External surface		0.000	0,100	0.100	0.000	0.000	0.0
I. Taing, clay	15.0	1.000.1	0,0003	0.1003	250.0	3.75	3.7;
2. air gap / Battens	25.0	0.220	0.0353	0.100	0.000	6,000	3.7:
3. *Correction rost protected by wind, e90.31	25.0	0.000	0.056	0.156	0.000	6.000	3.7:
4. BoostR Hybrid	35.0	0.090	1.350	1.506	0.000	U.60	4.3:
5. Hybris - Associated Air Gap / Rather 175mm	14.5	1800.0	0.470	1.9?6	(i 1314)	0.015.03	4.3:
6. Hybris / Rafter 175mm	125.6	0.033	3,788	5,764	0.000	450.00	454.3
2. Hybris - Associated Air Gap / Rafter 175mm	14.5	0.000	0,443	6.207	0.000	0.000	454.3
8. Plasterboard	12.5	0.190	0,066	6.273	45.0	0.56	454.9
Internal surface	•	0.000	0.3460	6.273	0.0040	0.000	454.9

2 Flinkara Energy Nyaems Landred Registered Diffice Unit 10, St. Jokas Rasiness Park, Langrannik, Lenesaerstere US17 4118

BM TRADA

Page **29** of **48** 

Vapour pressure table:									
Interface - between layers	Interface Temp.	Vapour pressure Pa	Satur. vapour pressure Pa	Dew point 'C	Cond. rate gin2.h	Cond. rate 60 days pin2.h	Cond. risk XN		
External surface	-2.00	491.2	517.1	-2.95	0.00	0.00	Nø		
1. External surface / Tilling, clay	-1.64	491.2	532.9	-2.95	0.00	0.00	Ne		
2. Tiling, clay / air gap / Battens	-1.64	499.5	532.9	-2.73	0.00	0.00	Ne		
3. sir pap / Battens / *Correction roof protected by wind, e=0.31	-1.64	499.5	\$32.9	-2.73	0.00	0.00	Ne		
4. *Correction roof protected by wind, e=0.31 / BoostR IIybrid	-1,44	499.5	\$42.0	12.73	0.00	0.00	Na		
5. BoostR Hybrid / Hybris - Associated Air Gap / Rafter 175mm	3.44	500.8	781.1	-2.69	0.00	0.00	Na		
6. Hybris - Associated Air Gap / Rafter 175mm / Hybris / Rafter 175mm	5.13	500.8	879.9	-2.69	0.00	0.00	Ne		
7. Hybris / Rather 175mm / Hybris - Associated Air Gap / Rather 175mm	18.80	1.490.1	2.169.3	12.93	0.00	0.00	Ne		
8. Hybris - Associated Air Gap / Rafter 175mm / Plasterboard	20.40	1.490.1	2 395.7	12.93	0.00	0.00	Na		
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	Ne		







BM TRADA

Page **30** of **48** 



e Elesberst Energy System Limited Registered Office Unit 16, 50 Johns Business Park, Latterworth Leicestenhire LE17 4HB

BM TRADA

Page **31** of **48** 



### Pitched roof @ 600c U-value = 0.18 W/m<sup>2</sup>K

BM TRADA

Page **28** of **48** 

#### UVALUE CALCULATION

Fuel Bill: £0.00 Energy used: 0.0 GJ per annum

Users Ref: 00 TECHNICAL EXERCISES

Issued on: 31.July.2017 Prop Type Ref: Carbon Index: 0.0

CO2 Emissions: 0.00 t/year

Property:

SAP Rating: 0

Serveyer: . Address:

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

of Type: Pi	tched Roof, insulated sleping ceiling							
Layer	Description	Thickness	λ.	R	Fracti			
2. Mergal S	urface			0.100				
Layer3	Tiling, concrete							
	Main construction	វេទ ជាអា	1.500	0.000	100.00			
Layer2	Airspace/file battens							
	Main construction	25 mm	0.156	0.(XIU	87,3			
	Corrections - Cavity Unventilated, Emissivity: Norr	anal						
	Bridging - Timber	25 mm	0.156	0.000	12.6			
Layer3	Airspace/counter battens							
	Main construction	25 mm	0.250	O.(NRF	91.6			
	Corrections - Cavity Ventilated, Emissivity: Normal	1						
	Bridging - Timber	25 mm	0.130	0.18HI	8.3			
Layer4	Breather membrane				•			
	Main construction	0 unm	0.084	0,005	106.0			
Layers	058	1						
•	Main construction	11 យោ	0.130	0.085	100.0			
3 93076	livinis - Associated Air Guo / Rafter 200mm							
	Main construction	15 mm	0.637	0.407	92.1			
	Bridging - Tinsber	15 ເກສາ	0.130	о.(ик)	7.8			
Laver7	Bybris / Rafter 200mm							
-	Main construction	170 mm	0.033	5.152	. 22.1			
	Corrections - Air Gan, Level 0, Fasteners: None or plastic							
	Bridging - Timber	t70 mm	0.130	0.000	. 7.8			
Layer8	Rypris - Associated Air Gap / Rafter 200mm	1						
•	Main construction	15 mm	0.034	0.44	. 92.1			
	Bridging - Timber	t\$ mm	0.130	0.040	7,8			
1.23079	Polythenr, 500 gauge							
-	Main construction	0 mm	0.000	D.(NNF	160.0			
3.ayer30	Plasterboard							
-	Main construction	13 mm	0.190	0.066	166.0			
laterard -				0.100				
Total series	Trace Trace Uncer Each = C (19 m/V/W) Lorent Each = C MP = 201	w Australia	ALL STREET	0.100				
retai resis	opper and = 5.018 mrk/w Lower and = 5.245 mrk/	w Average - :	AND BEACH					
	U-value (unround	ca) = 0.1841 W/s	n/K		_			

o Elseboret Energy Systems Limited Registered Office Unit 16, St Johns Basiness Park, Latherworth, Leicentenbire LE17 408

**BM TRADA** 

Page 29 of 48

	COND	ENSA	TION R	ISK AN	ALYSIS					
Users Ref: 00 TECHNICAL EXERCISES					lus Prop T Carbon	ned on: 31. spe Ref: Index: 0.0	July.2017			
AP Rating: 0		Fu	d Bill: £0.0	00 GJ per ann	CO2 Emissions: 0.00 Uyear					
urveyor: , ddress: <u>bent</u> offware AP version: 0.00 Regs Reg Jeculation method: BS EN	ion: England and Wale ISO 6946, IIS IIN ISO	s, Calcul	ation Type: 1 S 5250	New Build						
Roof TE1081 - r-tp H170 5	2.600c=0.15									
Environmental conditions:										
External conditions:	Temperature: 5 °C	-	Relativ	e Hunidity: *	95 %					
Internal conditions:	Temperature: 15 °C		Relative Humidity: 85 %							
Table of layors:										
Table of layon: Layor		Width	Thermal conduct. Win.K	Thermal resistance m2.K/W	Camulative thermal resistance n2.K/W	Vapour resistivity GN.skg.m	Vapour resistance GN_33g	Consulation vapou resistance GN A		
Table of legens: Layer External surface		Width mm	Thermal conduct. Wim.X 0.000	Thornal resistance m2K/W 0.100	Camulative thermal resistance s2.K/W 0.100	Vapour nesistivity GN,skg.m 0.000	Vapour resistance GN s Ng 0.000	Currulative vapou resistance GNA 0.0		
Table of layon: Layor External surface 1. Tiliag, concrete		Width mm - 15.0	Thermal conduct. WierX 0.000 1.500	Thornal resistance m2.K/W 0.100 0.000	Cannolative thermal resistance s2.K/W 0.100 0.300	Vapour resistivity GN.skg.m 0.000 0.000	Vapour resistance OX.skg 0.000 0.000	Consulation vapou resistance ON Aly 0.00		
Toble of layons: Layor External surface 1. Tilling, concrete 2. Airspace/life battens		Width mm 15.0 25.0	Thermal conduct. Wine X 0.000 1.500 0.(HK)	Thermal resistance ==2.6/W 0.100 0.000 0.000	Canulative thermal resistance #1KW 0.100 0.300	Vapour nesistivity CN.skg.m 0.000 41,090 41.090	Vapoue resistance 0.000 0.000 0.000	Correctation vapou resistance OK.45 0.00 0.00 0.01 0.01 0.01		
Toble of layons: Layon External surface 1. Tilling, concrete 2. Airspace/ille battens 3. Airspace/unimer battens		Width 	Thormal conduct. 92.552 0.000 1.550 0.000 0.000 0.000	Thermal resistance ==2 K.W 0.100 0.000 0.000 0.000 0.000	Camulative thermal resistance #1.KW 0.100 0.300 0.300 0.300	Vapour nesistinity 00.stg.m 0.000 41,090 41,090 41,094 41,094	Vapour nosistance 0.000 0.000 0.000 0.000	Consulation vapos scalatano GN sta 0.0 0.0 10.0 0.0		
Toble of logens: Layer External surface 1. Tilling, concrete 2. Airspace/tile battens 3. Aurspace/connet battens 4. Breatter menchane		Widdh 	Thermal conduct. 9.000 1.500 0.(480 0.(480 0.084	Thermal resistance =2.K.W 0.100 0.000 0.000 0.000 0.000 0.000	Camulative thermal resistance #1.6/W 0.100 0.300 0.300 0.300 0.300	Vapose nesistivity 00.54g m 0.000 41.050 41.650 41.650 41.650 41.600	0.000 0.000 0.000 0.000 0.000 0.000 0.000	Consultation vapous scattatano oxadu 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.		
Telefe of logens Lager External surface 1. Tilling, concrete 2. Alispace/lile battens 3. Auspace/cumter battens 4. Becattur: menchume 5. OSB		Widdh 15.0 25.0 25.0 10.4 11.0	Thermal conduct. 9.000 1.500 0.7889 0.3890 0.084 0.130	Thermal resistance =2.K.W 0.100 (0.000 0.000 0.000 0.000 0.005 0.085	Camulative thermal resistance 0.300 0.300 0.300 0.300 0.300 0.300 0.300	Vapour nesistivity 00.54g m 0.000 41.000 41.000 41.000 0.3051 41.000 2551.0	Vapore 0.000 0.000 0.000 0.000 0.000 0.000 0.40 2.75	Consultation vapous resistance (0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.		
hide of legens Layer External surface 1. Tilling, concrete 2. Aitspace/lile battens 3. Auspace/lile battens 4. Becatter menchrane 5. OSB 6. Itylwis - Associated Air		Width 15.0 25.0 25.0 11.4 11.0 15.0	Thormal conduct 9.000 1.500 0.046 0.084 0.130 0.084	Thermal resistance 0.100 0.000 0.000 0.000 0.000 0.000 0.000 0.005 0.085 0.085	Camulative thermal resistance 0.300 0.300 0.300 0.300 0.300 0.300 0.300 0.300 0.300 0.300	Vapor resistanty 0.000 0.050 0.050 0.050 0.050 0.050 0.050 0.050	Vapose nesistance 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000	Consultative variants (X x y) 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.		
Telefe of legense Layer External surface 1. Tilling, concrete 2. Alispace/dile batterns 3. Auspace/cumter batterns 4. Breatter menufmanz 5. OSB 6. Hybris - Associated Air 7. Hybris / Kafter 200man		Width 15.6 25.0 25.0 14 11.0 15.0 170.0	Полнай сондал. 2.500 0.0480 0.0480 0.0440 0.330 0.0441 0.043	Themai resistance = 2.6.W 0.100 0.000 0.000 0.000 0.005 0.085 0.085 0.085 0.152	Camulative thermal resistance 0.300 0.300 0.300 0.300 0.305 0.100 0.597 5.748	Vapor resistanty 0.000 0.096 0.096 0.096 0.096 0.090 0.090 0.090 0.090 0.090	Vapour resistance 0.0000 0.0000 0.0000 0.0000 0.000000	Consultative values constance consta		
Toble of layons Layon External surface 1. Tilling, concrete 2. Aitspace/life battens 3. Autspace/cumter battens 4. Becattuer menufmanz 5. OSB 6. Bytwis - Associated Air 7. Hybris / Kafter 2010ma 8. Hybris - Associated Air	Sap / Rafter 200mm Gap / Kafter 200mm	Width 15.6 25.0 25.0 15.0 15.0 170.0 15.0	Полнай сондал. 2.560 0.786) 0	Thermal resistance 0.100 0.000 0.000 0.000 0.005 0.055 0.055 0.152 0.443	Camulative thermal resistance 0.300 0.300 0.300 0.305 0.105 0.507 5.748 0.51	Vapor resistricity 00.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000	Vapour 00.000 0.000 0.000 0.000 0.000 0.000 0.400 450.00 0.000	Consultative values excitations (06.45) (0.0) (0		
Toble of layers: Layer External surface 1. Tilling, concrete 2. Airspace/life battens 3. Airspace/life battens 4. Breattler membranz 5. OSB 6. Bybris - Associated Air 7. Hybris / Kafter 200mar 8. Hybris - Associated Air 9. Polythene, Sido gauge	Sap / Rafter 200mm	Width 	Полия сондат. 2000 1.500 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000	Thermal resistance =2.6.W 0.100 0.000 0.000 0.000 0.005 0.005 0.005 0.005 0.005 0.005 0.005 0.001 0.000	Camulative thermal resistance =1.87W =0.100 0.100 0.100 0.100 0.100 0.100 0.100 0.507 5.748 0.591 6.591	Mapore sesistivity 0.0000 0.0500000000	Vapour 00.000 0.000 0.000 0.000 0.000 0.40 2.75 0.000 480.00 0.400 250.00	Consultation values consultation consultation do do do do do do do do do do do do do		

o Elinkuss Prierge Systems Eduáric Registered Office Gun (a. St. Johns Business Park, Egnerssann, J. elevatershile (1917-404)

BM TRADA

Page **30** of **48** 

Vapour pressure table:							Tage:
Interface - between layers	Interface Icmp.	Vapour pressure Fa	Satur. vapour pressare Po	Dew point *C	Cond. rate pin2.h	Cond. rate 60 days gin2.b	Cood. mk
External surface	5.00	\$28.3	\$71.9	4.27	0.00	0.90	No
1. External surface / Tiling, concrete	5.16	828.3	881.5	4.27	0.00	0.00	No
2. Tilling, concrute / Airspace/tile battens	\$.16	828.3	881.5	4.27	0.00	4,57	No
3. Airspace/tile battens / Airspace/counter battens	5.16	828.3	181.5	4.27	9.00	4.57	No
4. Airspace/counter battens / Breather membrane	\$.16	\$28.3	\$\$1.5	4.27	0.00	4.57	No
5. Breather membrane / OSB	5.17	828.6	\$82.0	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	\$30.7	4.32	0.00	0.90	No
8. Hybris / Rafter 200mm / Hybris - Associated Air Gap / Rafter 200m	14.04	1.227.8	1 602.1	10.61	0.00	0.00	No
9. Hybris - Associated Air Gap / Rafter 200mm / Polythene, 500 gauge	14.74	1 227.8	1 676.0	00.00	0.00	0.00	No
10. Polythene, 500 gauge / Plasterboard	14,74	1.448.3	1 636.0	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





BM TRADA

Page **31** of **48** 



> Einforte Energy Systems Limited Registered Office Unit 16, 5t Johns Business Park, Latterworth, Leisenenhire LE17 4888

BM TRADA

Page **32** of **48** 



**BM TRADA** 

Page **33** of **48** 

								Page: 1
	CONE	DENSA	TION I	RISK AN	ALYSIS			
Users Ref: 00 PAT		Issued on: 7.December.2016 Prop Type Refi						
Property:					Carbon	Indes: 0.0		
SAP Rating: 0		Fu	el Bill: £0.	00	CO2 Em	issions: 0.0	0 t/year	
		Energ	weed: 0.0	GJ per ann	um			
Sarveyor: . Address: Client:								
Software SAP version: 0.00 Regs Re Calculation method: BS E	igion: England and Wale N ISO 6946, BS EN ISO	s, Calcul 13370, B	ation Type: IS 5250	New Build				
Floor PF101 - f-ts 155h §	(400c = 0.16							
Environmental conditions:								
External conditions:	Temperature: 5 °C		Relati	ve Humidity:	95 %			
Internal conditions:	Temperature: 15 °C	2	Relative Humidity: 85 %					
Table of layers:								
Layer		Width	Thermal conduct. Win K	Thermal resistance n2.K/W	Cumulative thermal resistance m2.8/W	Vapour resistivity Otalgan	Vapour resistance GN-skg	Cumulative vapour resistance GN skg
External surface			0.000	0.170	0.179	0.000	0.000	0.00
1. Breather membrane		0.4	0.800	100.0	0.171	ALKA.CF	0.40	0.40
2. Hybris - Associated Ai	а Сар	22.5	0,00	0.705	0.876	(),qnini	ຄຸກສຸມ	0.40
3. Hybris		155.0	0.033	4,697	5.573	0.000	450.00	450.40
4. Hybris - Associated Ai	ir Gap	22.5	(1.000	0.705	6.278	0.000	0.000	450.40
5. Chipboard		18.Ú	0,150	0.138	6,416	300.0	5.40	455,80
Internal surface		-	0.000	44, t 70	6416	10,600	000 D	455,80

o Elinbursi Energy Systems Lunded Registered Office Unit 36, St Johns Bismess Park, Lunerworth, Leicestendare LE37 4181

Vapour provare table:								
Interface - between layers	Interface temp. *C	Vapour pressure Pr	Satur. vapour pressure Ps	Dew peint "C	Cond. rate pin2.h	Cond rate 60 days gin2.b	Cond risk YS	
External surface	5.00	828.3	871.9	4.27	0.00	0.00	Ne	
I. External surface / Breather membrane	5,26	\$28,3	887.7	4.27	0.00	0.00	Ne	
2. Breather membrane / Hybris - Associated Air Gap	5.26	\$28.5	887.8	4.28	0.00	0.00	Ne	
3. Hybris - Associated Air Gap / Hybris	6.33	\$25.8	956.2	4.28	0.00	0.00	Ne	
4. Hybris / Hybris - Associated Air Gap	13.46	1.441.4	1 542.7	12.42	0.00	0.00	No	
5. Ilybris - Associated Air Gap / Chipbeard	14.53	1.441.4	1 653.7	12.42	0.00	0.00	No	
6. Chipboard / Internal surface	14.34	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	Ne	







6 Elimbard Energy Systems Limited Registered Office Unit 16, St Admit Baciness Park, Latterworth, Leicentershite LE17 4801

BM TRADA

Page **34** of **48** 

		UVALUE CAL	CULATION					
lsers Ref: mperty:	00 PATHFINDER 2017	la Prop I Carbo	Issued on: 7.December.2016 Prop Type Ref: Carbon Indes: 0,0					
AP Rating:	0	Fuel Bill: £0.00 CO2 Emissions: 0.00 t/year						
		Energy used: 0.0	GJ per annum					
arveyor: , ddress: lient: oftware AP version: 0 alculation me	100 Regs Region: Fingland and Wa	les, Calculation Type: O 13370, BS 5250	New Build					
Building Lieu	water							
Building Eler	nent Floor PF101 - 646 155h @40	0c = 0.16						
Floor Type:	Suspended							
Area = 85.90	m <sup>2</sup> , Perimeter = 42.95 m, Wall this	ckness = 257 mm, Soil:	Unknown					
Depth of und	erfleer space below ground:	0.500 m	Floor wind shielding:	Average (subs	athan)			
Floor height	above ground:	h = 0.225 m						
U-value of w	alls above ground:	Uw = 0.160 m						
Ventilation of	penings per perimeter length:	c = 0.0015						
Mean wind s	peed	v = 5.000 m/s						
Resistance or	n solum:	Rg = 0.000 m/K/W	r					
Layer	Description		Thickness	λ	R	Fraction		
Esternal	surface				0.170			
Layer1	Breather membrane Main construction		0 mm	0.500	0.001	100.00 %		
Laver2	Hybris - Associated Air Gan							
Laytra	Main construction		23 mm	0.032	0,205	88,25 %		
	Bridging - Timber		23 mm	0,130	0.000	11.75 W		
Layer3	Hybris .		144	4.475		00 77 41		
	State construction	Served in March 19	a an	1033	4.627	80.20.2		
	Coursections - 760 4	rap: r,everu, rasienets	a come or plastic	0.150	0.000	11.25.20		
1	Decognig - rander		C22 400	ar. 1 (es)	0.000	4.77 %		
1.2) era	Main construction		23 mm	0.032	0.705	88,25 M		
	Bridging - Timber		23 mm	0.130	0.000	H.75 %		
Layer5	Chiphoard Main construction		18 mm	0.130	0.138	100.00 %		
luternat s	งหาโลดห				0.170			
Total rest	stance: Upper limit ~ 5.655 n	"K/W Lower limit - "	5.006 m <sup>2</sup> K/W Average > 1	5.331 m°K/W				
	copertaine states	U-value	e (unrounded) = 0,1876 W/i	19 <sup>7</sup> K				
Suspendo	d floor corrections:							
B' = 4.000	20							
	Total thickness: 2	15 mm	U-value: 0.16 W/m	e/K				

() Handaper Verenge Systeme Limited Registered Office Unit 16, St Johns Business Park, Linterwood, Leicesterskire LIPT 4041

BM TRADA

Page **35** of **48**