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**BAR-18-035-P-A-UK**  
**BDA Agrément®**  
**Duratherm**  
**Spray Foam Roof Insulation**

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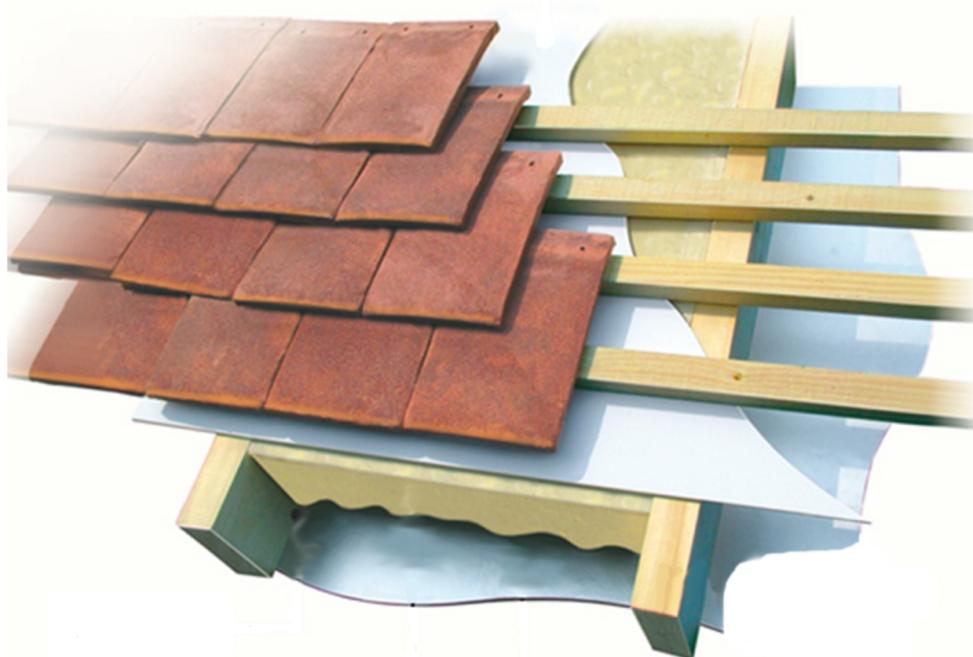
## SCOPE

This Agrément relates to Duratherm Spray Foam Roof Insulation (hereinafter the "Product"), an in-situ HFO blown spray-applied thermal insulation layer which contributes to the airtightness and watertightness of roofs. It is effective in improving the thermal transmittance (U-value) of roofs with a pitch in excess of 15°. The Product is for internal application to the underside of pitched roofs of existing or new domestic buildings in the UK with Type LR breather membranes (new build or retrofit), Type HR breather membranes (retrofit) or sarking boards.

## DESCRIPTION

The Product consists of two liquid components that are spray applied to form a closed cell structure, chemically modified, rigid polyurethane (PUR) seamless foam insulation layer to BS EN 14315-2 that adheres to all of the treated surface. It is produced by an exothermic reaction between the isocyanate component (A) and the resin component (B). Once applied the Product expands, solidifies and cures. The Product is applied in layers, until the final required design thickness (not exceeding 400 mm) is achieved.

## PRODUCT ILLUSTRATION



## THIRD-PARTY ACCEPTANCE

**NHBC** - For detailed information see section 3.3 (Third-Party acceptance).

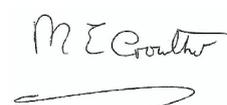
## STATEMENT

It is the opinion of Kiwa Ltd. that the Product is fit for its intended use, provided it is specified, installed and used in accordance with this Agrément.

Paul Oakley, BSc  
Technical Manager, Building Products



Mark Crowther, M.A. (Oxon)  
Kiwa Ltd. Technical Director



## SUMMARY OF AGRÉMENT

This document provides independent information to Specifiers, building control personnel, contractors, installers and other construction industry professionals considering the fitness for the intended use of the Product. This Agrément covers the following:

- Conditions of use;
- Initial Factory Production Control, Quality Management System and the Annual Verification procedure;
- Points of attention for the Specifier and examples of details;
- Installation;
- Independently assessed Product characteristics and other information;
- Compliance with national Building Regulations, other regulatory requirements and Third-Party acceptance;
- Sources, including codes of practice, test and calculation reports.

## MAJOR POINTS OF ASSESSMENT

**Thermal insulation properties** - The Product improves the thermal insulation of the roof and has a declared thermal conductivity ( $\lambda_D$ ) of 0.025 W/mK\* (see section 2.1.10).

**Water vapour transmission and condensation risk** - The Product has adequate water vapour transmission resistance; the Product will contribute to limiting the risk of interstitial and surface condensation (see section 2.1.10).

**Water permeability** - The Product has adequate watertightness to prevent wind-driven rain infiltration into a building (see section 2.1.10).

**Behaviour in relation to fire** - The Product is classified as Euroclass E\* (combustible) according to BS EN 13501-1 (see section 2.1.10).

**Durability** - The Product will have a service life equivalent to that of the roof structure in which it is incorporated (see section 2.1.8).

**CE marking** - The Agrément holder has taken responsibility for CE marking the Product in accordance with all relevant harmonised European Product Standards. An asterisk (\*) appearing in this Agrément indicates that data shown is given in the Product manufacturer's Declaration of Performance (DoP).

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## CHAPTER 1 - GENERAL CONSIDERATIONS

### 1.1 - CONDITIONS OF USE

#### 1.1.1 Design considerations

See section 2.1.

#### 1.1.2 Application

The assessment of the Product relates to its use in accordance with this Agrément and the Agrément holder's requirements.

#### 1.1.3 Assessment

Kiwa Ltd. has assessed the Product in combination with its relevant DoPs, test reports, technical literature and factory and site visits. Also, the NHBC Standards have been taken into consideration. Factory Production Control has been assessed.

#### 1.1.4 Installation supervision

It is recommended that the quality of installation and workmanship is controlled by a competent person. Such person shall be either a qualified employee of the Consulting Engineer or an employee of the installing contractor. The Product shall be installed strictly in accordance with this Agrément and the Agrément holder's requirements.

The Product shall only be applied by installers who have been trained and approved by the Agrément holder under the Quality Installer Scheme.

The Product shall be installed strictly in accordance with the Installation Manual of the Agrément holder and the requirements of this Agrément.

#### 1.1.5 Geographical scope

The validity of this document is limited to England, Wales, Scotland and Northern Ireland, with due regard to chapter 3 of this Agrément (CDM, national Building Regulations and Third-Party Acceptance).

#### 1.1.6 Validity

The purpose of this BDA Agrément® is to provide for well-founded confidence to apply the Product within the Scope described. The validity of this Agrément is three years after the issue date, and as published on [www.kiwa.co.uk/bda](http://www.kiwa.co.uk/bda). After this, the validity of this Agrément can be extended every three years after a positive review.

### 1.2 - INITIAL FACTORY PRODUCTION CONTROL (FPC)

- Kiwa Ltd. has determined that the Agrément holder has fulfilled all provisions of the specifications described in this Agrément in respect of the Product.
- The initial FPC audit demonstrated that the Agrément holder has a satisfactory Quality Management System (QMS) and is committed to continuously improving their FPC operations.
- A detailed Production Quality Specification (PQS) has been compiled to ensure traceability and compliance under the terms of this Agrément.

### 1.3 - QUALITY MANAGEMENT SYSTEM (QMS)

- The Agrément holder:
  - has an effective and well maintained QMS in operation which covers the necessary clauses required for BDA Agrément®.
  - is committed to continually improving their FPC, QMS and associated procedures.
- Document control and production line procedures were deemed satisfactory, with sufficient evidence provided in support of BDA Agrément® requirements.

### 1.4 - ANNUAL VERIFICATION PROCEDURE - CONTINUOUS SURVEILLANCE

To demonstrate that the FPC is in conformity with the requirements of the technical specification described in this Agrément, the continuous surveillance, assessment and approval of the FPC will be done at a frequency of not less than once per year by Kiwa Ltd.

**2.1.1 Design responsibility**

The Agrément holder reviews all designs submitted and offers design advice and guidance to ensure a compliant final project specific design.

**2.1.2 Applied building physics (heat, air, moisture)**

The physical behaviour of the roof incorporating the Product shall be verified as suitable by a competent specialist, who can be either a qualified employee of the Agrément holder or a qualified consultant. The Specialist will check the physical behaviour of the roof design and if necessary can offer advice in respect of improvements to achieve the final specification. It is recommended that the Specialist co-operates closely with the Agrément holder.

**2.1.3 General design considerations**

For retrofit applications, existing constructions must be in a good state of repair with no evidence of rain penetration or damp. Any necessary repairs must be carried out prior to installation.

New roofs should be designed and constructed to prevent moisture ingress and air infiltration.

The Product must only be applied to a roof construction incorporating a Type LR underlay or a Type HR underlay.

In retrofit applications where the roof space is being converted into a heated habitable room, the Product can be applied directly to a Type HR underlay where a suitable VCL is used.

For new build construction, where the roof space is a warm non-habitable or habitable pitched roof (with insulation to the roof slope), the Product should be applied to a Type LR underlay according to the requirements of BS 5250.

A suitable vapour control layer (VCL) incorporating lapped and sealed joints must be applied behind a plasterboard lining in roof applications, unless an assessment to BS 5250 indicates that it is not necessary.

Where the Product is applied to the underside of sarking boards within roof spaces, the ventilation strategy must be in line with the guidance in BS 5250 taking into account the type of roof tile underlay used.

Ventilation openings should be arranged to prevent the ingress of rain, snow, birds and small animals and the risk of subsequent blockage by other building operations.

For internal fire protection, the Product must be covered by a suitable lining board with the joints fully sealed and supported by timber studwork elements except when used in a non-habitable roof space.

Do not apply the Product over electrical cables, recessed lighting, existing vents or ventilation gaps. Consider re-routing, re-laying in conduit or trunking or de-rating electrical cables. Replace existing recessed lighting with ventilated fittings which incorporate a protective fire hood.

The Product is a closed cell foam which is inert once cured and is therefore chemically inactive by definition. The Product will not react with metals typically used in construction elements.

Installation of the Product must not be carried out until the moisture content of any timber is less than 20 %.

**2.1.4 Project specific design considerations**

Prior to the application of the Product, an inspection will be carried out to check:

- external inspection of roof, valleys, gutters, chimney stacks, flashings etc.;
- condition of any sarking/breather membrane present - felt or paper, new or old;
- the type, suitability and condition of roof timber to be insulated;
- roof space ventilation requirements and location of ventilation holes;
- that the timbers or sarking substrates are firm and consistent;
- that the substrates are free of dust, grease or oils and are clean;
- there is no existing rain ingress and there are no signs of dampness, staining or condensation on the inner face of the roof;
- existing roofs are structurally sound;
- existing roofs are weathertight;
- identify areas not to be spayed.

**2.1.5 Permitted applications**

Only applications designed according to the specifications as given in this Agrément are allowed under this Agrément, in each case the Specifier will have to co-operate closely with the Agrément holder.

**2.1.6 Installer competence level**

The Product shall be installed strictly in accordance with the instructions of the Agrément holder and the requirements of this Agrément.

Installation shall be by contractors with employees trained and approved by the Agrément holder.

**2.1.7 Delivery, storage and site handling**

The Product components A and B are delivered to site in drums, bearing the Product name and batch number and marked with the BDA Agrément® logo incorporating the number of this Agrément.

The components are sensitive to moisture and should be stored in sealed drums or hermetically sealed tanks. Containers must be protected from water and moisture. Sealed drums should be stored between 10 °C and 25 °C, in a well-ventilated area and out of direct sunlight.

### **2.1.8 Durability**

There is no mould risk and the Product does not support vermin or insects.

The Product is considered to be adequately resistant to deterioration and wear by the normal service conditions, provided it is installed in accordance with the requirements of this Agrément. The Product is typically installed with protection and hidden so is not subject to physical attacks.

The reaction to fire does not decrease with time in accordance with BS EN 14315-1.

The adhesion after ageing on substrates is considered sufficient to ensure the stability of the Product.

The Product is resistant to heavy acids and alkalis, seawater, industrial waste gases and aliphatic hydrocarbons (mineral oil, petrol, diesel fuel, etc).

The Product is durable, rot-proof and will have a service life equivalent to that of the structure in which it is incorporated.

The Product should remain effective for at least 20 years in a pitched roof without roof tile underlay.

### **2.1.9 Maintenance and repair**

The Product once installed, does not require regular maintenance provided the weathertightness of the roof is maintained. Damaged or poorly applied Product should be completely removed and re-applied. For advice in respect of repair and maintenance concerns, consult the Agrément holder.

### **2.1.10 Performance factors in relation to the Major Points of Assessment**

For the installed Product to BS EN 14315-2 and BS EN 13172:

#### **Thermal insulation properties**

The installed Product has a relatively high thermal resistance to BS EN 12667 to its relatively thin insulating layer thickness, saving room space. The Product has a low declared aged thermal conductivity due to its closed cell structure.

For the purpose of U-value calculations and to determine if the requirements of national Building Regulations are met, the thermal resistance and U-value of roofs incorporating the Product should be calculated according to BS EN ISO 10211 (taking into consideration BS EN ISO 6946, BS EN ISO 10456 and BRE Report 443), using the Product's declared thermal conductivity ( $\lambda_D$ ). Design and declared thermal values can be found in BS EN ISO 10456.

The Product can be used to upgrade properties that already have insulation in place to meet current U-value requirements.

The maximum thickness of the Product should not exceed 400 mm. For improved thermal/carbon emissions performance, additional batten/insulation thicknesses may be required.

Account should be taken of Government Accredited Construction details for Part L, England and Wales - Timber frame detail illustrations and Accredited Construction details, Scotland. Care is needed for design at openings, and the correct level of workmanship and design detailing of joints particularly around rooflight openings should be in accordance with BS 6093.

The requirement for limiting heat loss through the building fabric, including the effect of thermal bridging can be satisfied if the thermal transmittance (U-value) of the roof incorporating an appropriate thickness of the Product does not exceed the maximum and target U-values given in the national Building Regulations.

The Product can insulate surfaces in restricted or curved areas which are typically hard to treat.

#### **Thermal bridging at junctions and around openings**

Care must be taken in the overall design and construction of junctions with other elements and openings to minimise thermal bridges and air infiltration. Guidance on linear thermal transmittance, heat flows and surface temperature factors can be found in the documents supporting the national Building Regulations and BS EN ISO 10211, BRE Information Paper 1/06, BRE Report 262, BRE Report 497 and PAS 2030 - Building Fabric Measures (BFM).

The applied Product forms a solid and seamless air tight insulating foam layer without joints or gaps, reducing thermal bridges.

#### **Cell structure**

The Product has a high volume closed cell % in accordance with BS EN ISO 4590.

#### **Water vapour transmission resistance**

The Product has a low level of water vapour transmission (high water vapour resistance) in accordance with BS EN 12086 Method A and does not favour the accumulation of water vapour between the Product and substrate.

#### **Condensation risk**

Roofs incorporating the Product will adequately limit the risk of interstitial and surface condensation when designed in accordance with BS 5250, BRE Report 262 and BRE Digest 369. Roof spaces should be ventilated in accordance with BS 5250. Care should be taken to provide adequate ventilation, particularly in rooms expected to experience high humidity, and to ensure the integrity of VCL's (where installed) and linings against vapour ingress.

A Condensation Risk Analysis can be carried out by the Agrément holder on a project specific basis, in accordance with BS 5250 and BS EN ISO 13788.

#### **Water permeability**

The closed cell structure means the Product is water-resistant.

The Product has adequate short-term water absorption by partial immersion in accordance with BS EN 1609, Method B.

When the Product is applied with a minimum thickness of 30 mm can be considered to offer a high resistance to rain water infiltration, i.e. a type B3 barrier (rendering). The Product can be considered to act as a barrier against water penetration.

It is important that the roof is correctly executed, to prevent water ingress at rooflight openings, etc.

The Product, when properly installed in accordance with this Agrément, will resist rain penetration to the roof structure.

The Product is frost and heat-resistant from -50 °C to +100 °C.

#### **Behaviour in relation to fire**

The Product has a flammability - surface spread of flame Class 1 in accordance with BS 476-7.

The Product has a reaction to fire performance classification of Euroclass E\* (combustible) in accordance with BS EN 13501-1.

The Product must be protected from naked flames and other ignition sources during and after application.

In situations where there is a higher than average risk of fire, the Product must be suitably separated from any potential source of ignition.

The exposed Product could contribute to the development stages of a fire, however this would be to a limited extent in the early stages of a fire.

Once installed, except for a non-habitable roof application, the Product should be contained by a suitable lining board, e.g. one or two layers of 12.5 mm gypsum plasterboard dry-lining or ceiling lining correctly fixed to rafters or studwork elements and with all plasterboard joints taped, sealed and supported by rafters, noggins or battens.

Consequently, in these conditions, the Product will not contribute to the development stages of a fire. The Product must not be applied over junctions between roofs and on walls required to provide a minimum period of fire resistance. Care must be taken to ensure continuity of fire resistance at junctions with fire-resisting elements, in accordance with the national Building Regulations.

Roofs must incorporate cavity barriers at edges, around openings, at junctions and in extensive cavities with fire-resisting elements in accordance with the relevant provisions of the national Building Regulations. The design and installation of cavity barriers must take into account any anticipated differential movement.

Replace existing recessed lighting with ventilated fittings which incorporate a protective fire hood.

The use of the Product in slated or tiled pitched roofs should not affect the external fire rating when evaluated by assessment or test to BS 476-3.

#### **Proximity of flues and appliances**

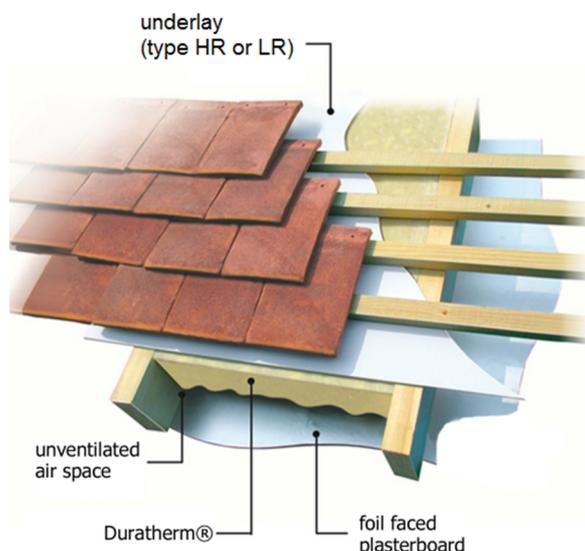
The Product must be separated by the minimum distance from heat-emitting flue pipes, fixed combustion appliances, incinerators, devices, fireplaces and chimneys and any potential source of ignition where the temperature is in excess of 70 °C, by non-combustible material in accordance with the provisions of the national Building Regulations.

#### **Materials in contact - wiring installations**

De-rating of electric cables should be considered in areas where the Product restricts the flow of air. Electrical cables should not be encapsulated within the Product. Where the Product is likely to bond to electric cables, suitable conduit or trunking must be used.

## 2.2 - EXAMPLES OF DETAILS

**Figure 1 - Typical warm pitched roof application - LR underlay new build or retrofit, HR underlay retrofit only**



### 2.3.1 Installer competence level

The Product shall be installed strictly in accordance with the instructions of the Agrément holder and the requirements of this Agrément.

Installation shall be by contractors with employees trained and approved by the Agrément holder

### 2.3.2 Delivery, storage and site handling

The two components of the Product are delivered to site in separate closed 205 litre type 1A1 drums. Both containers are labelled with component name and batch number and marked with the BDA Agrément® logo incorporating the number of this Agrément.

The optimum storage temperature is between 10 °C and 25 °C. The drums should not be exposed to direct sunlight, high temperatures or temperatures below - 10 °C for long periods of time. Drums should be stored in a well-ventilated area protected from heat and frost and away from possible ignition sources.

Components A and B are sensitive to humidity, so they should be stored in sealed drums or hermetically sealed tanks. Containers must be protected from humidity and rain.

The liquid isocyanate component is classified as 'harmful', under The Chemicals (Hazard Information and Packaging for Supply) Regulations 2009 (CHIP 4) and drums bear the appropriate hazard warning signs. When cured, the Product is non-hazardous.

### 2.3.3 General

Installation of the Product and ancillary items shall be carried out in a workmanlike manner in accordance with the Agrément holder's Installation Manual and current good building practice, by installers trained and approved by the Agrément holder.

During application, prohibit contact with open flames and the presence of ignition sources.

Do not weld or cut metal which is in contact with the Product. If it is necessary to weld metal elements, this must be done before applying the Product.

Application of the Product may produce a build-up of harmful vapours. Installers must wear personal protection equipment (PPE) when working with the Product. Some vapours given off by component chemicals are heavier than air and will tend to move to lower parts of the building compartment. These areas should be suitably ventilated. In certain conditions (e.g. application in a confined space) the use of extractor fans is recommended. Ensure proper ventilation in the work area.

Protective covers must be placed over water tanks to prevent contamination during application, and should not be removed until sufficient time has elapsed for potentially harmful vapours to be ventilated from the roof space.

To prevent the Product from entering an occupied space, the loft hatch/cover must be kept closed during the spraying process.

During spraying, the ambient air temperature and substrate temperature must ideally be between 15 °C and 25 °C and not be lower than 10 °C. Use an infrared or contact thermometer for checking substrate surface temperature.

On the surfaces of porous materials (ceramic or concrete), the moisture content of the substrate should not exceed 5 %. Non-porous surfaces, must be dry and free from condensation. The presence of surface humidity leads to the formation of a highly porous foam with deficient mechanical properties and low adhesion to the substrate.

The moisture content of any timber frame to be sprayed must be measured with a substrate hygrometer and be < 20 % before application commences.

The relative humidity of the air in the workplace must be less than 85 % to minimise the risk of surface condensation. Care should be taken to ensure that ingress of moisture vapour from the rest of the dwelling space is restricted.

When spraying, it is important to ensure that the compressed air of the machine is completely dry.

The spraying machine must be specially designed to mix and spray the Product via a spray gun. The Product is applied with a volumetric placement pump with fixed mixing ratio A/B = 1/1 by volume or 100/104 by mass. The ratio will be controlled prior to each application by measuring the flow rates of the two components before they pass through the mixer in the spraying machine. The value must not differ from 5 % by mass to the indicated value.

The machine must have a temperature controller in the preheaters and in the hoses. The working temperature must be set between 40 °C and 50 °C depending on the ambient temperature conditions.

Due to the short reaction time, the spraying can be performed on vertical elements without resulting in sagging. The Product hardens quickly although it will not be completely cured until approximately 24 hours have passed.

The Product must not make contact with heat-emitting flue pipes, appliances and chimneys, etc. If hot work is to take place near the Product, it must be cut back by 1 metre and protected by heat blankets.

A VCL may not always be required such as when the product is installed between the rafters in a non-habitable roof void.

Self-verification quality control checks provided for in BS EN 14315-2 must be carried out by the installer concerning core density 32-35 Kg/m<sup>3</sup> and appearance and thickness.

### 2.3.4 Site surface preparatory works

- The substrates must be clean, dry and free from dirt, dust, grease, oils and loose particles/torching;
- a small adhesion test to the substrate should be made to guarantee good bonding, especially on metal surfaces. This will determine if a primer is required for maximum adhesion;
- any necessary repairs to roofs such as replacing damp or broken/rotten timbers must be made prior to application;
- repair any damaged or dislodged valleys, gutters, flashings, slates or tiles;
- any timber treatment carried out;
- make roofs weathertight before application of the Product;
- cover front faces of surfaces not to be sprayed e.g. exposed joists, purlins and rafters;
- cover services e.g. electrical cables, water tanks and pipes;
- access to services, task lighting, safety and breathing equipment and ventilation facility (if required) should be positioned in the compartment to be treated prior to spraying.

### 2.3.5 Outline procedure

1. Set the temperature and pressure of components depending on the type of gun and mixing chamber to guarantee the mixing quality of the Product and obtain a suitable spraying aperture for the correct application of the Product.
2. The Product is sprayed onto a release surface to check for round spray pattern, sticky patches, light or dark patches/streaks, no voids, consistent colour.
3. The Product is sprayed into a plastic test bag to check appearance, control characteristics and reaction profile - cream time, gel time, tack free time, free rise density, using test methods in accordance with BS EN 14315-1, Annex E.
4. Interlaminar adhesion checked on a two layer spray sample and density checked 30-45 kg/m<sup>3</sup>.
5. Do not apply to heat-emitting devices, main roof trusses, electrical cables, recessed lighting and surfaces that are not firm or consistent.
6. The distance from spray gun to the substrate is recommended to be about 80 cm.
7. The Product is sprayed directly to the substrate in sections. The Product is applied starting at the bottom of the section. Each section is sprayed in a horizontal direction, from right to left and from left to right, continuously. Care should be taken to minimise the degree of overspray generated whilst spraying.
8. The first layer of Product is applied as a flash coat/primer (5 mm layer thickness using a quick pass) to give good anchorage to the surface. Care must be taken to ensure the integrity of the roof tile underlay drape when spraying the Product. Once this layer is cured (dry to the touch), the successive layers will be applied until the final total required thickness is reached.
9. The application thickness of each layer should be 15 - 20 mm. Additional passes should be applied within 10 minutes of the previous coat to give a minimum total thickness of 25 mm.
10. In the case of the application of thick layers, the waiting time between layers will be at least 10 minutes to guarantee that the remaining heat in the newly applied material has dissipated.
11. The Product should be built up in layers, until the final required design thickness (not exceeding 400 mm) is achieved. The total minimum Product thickness to be applied will depend on the required U-value. The applicator must check the total thickness applied by means of a depth gauge with measuring pin to ensure the required thickness is met. The applicator must be aware of the maximum insulation layer thickness in ventilated facade designs.
12. Once cured, in 2 hours, if required the Product can be trimmed flat using a hand-saw, being careful not to cut into timbers.

### 2.3.6 Typical applications:

#### New or existing pitched roofs with breathable roof tile underlay

The Product is sprayed between rafters onto the underside of existing Type LR breathable underlay in layers. The Product should be sprayed in a flash coat (5 mm thick) directly onto the underlay between rafters. The existing drape of felt will not be affected due to the first pass of the spray being liquid in nature, allowing the drape to remain. Care must be taken to ensure the integrity of the roof tile underlay drape. Subsequent coats (not exceeding 20 mm thick) are applied once the foam reaction has occurred.

#### Warm pitched roof - insulation between and under timber rafters.

The Product is applied under a Type LR roof tile underlay to the depth of the rafters. Cross-battens are then mechanically fixed to the rafters. The battens must be of sufficient width and spacing (up to 600 mm) to provide adequate support to which the plasterboard can be mechanically fixed and then filling resumes in 20 mm layers. A VCL should be on the warm side of the insulation behind the plasterboard lining

#### Ceiling boards, basement ceilings

The Product is applied directly to the underside of, or on top of a plasterboard ceiling lining, or under concrete basement floors.

### 2.3.7 Finishing

Waiting until the Product has completely cured is recommended.

Once installed, except when used in a non-habitable pitched roof space, the Product must be covered by a suitable lining board, e.g. 12.5 mm plasterboard, with all joints taped, sealed and supported by rafters, noggins or battens.

After installation in roof voids where the Product is left exposed, fire warning labels must be placed in prominent positions.

## 2.4 - INDEPENDENTLY ASSESSED PRODUCT CHARACTERISTICS

### 2.4.1 Thermal insulation properties

Declared aged thermal conductivity ( $\lambda_D$ ) to BS EN 14315-1, Annex C, ISO 8301 and BS EN 12667:  
0.027 W/mK for < 80 mm thickness, 0.026 W/mK for 80-120 mm thickness, 0.025 W/mK for > 120 mm thickness

### 2.4.2 Cell structure

Open and closed cell volume % to BS EN 14315-1 and BS EN ISO 4590 - mean 94 % closed cell content, Class CCC4.

### 2.4.3 Water vapour transmission

Water vapour transmission diffusion resistance factor  $\mu$  to BS EN 14315-1 and BS EN 12086, Method A - mean 38 for 70 mm thickness, mean 42 for 60 mm thickness.

### 2.4.4 Water permeability

Short-term water absorption by 24 hr partial immersion to BS EN 14315-1 and BS EN 1609, Method A, B - mean 0.09 Kg/m<sup>2</sup> for 60 mm thickness, mean 0.02 Kg/m<sup>2</sup> for 70 mm thickness.

### 2.4.5 Behaviour in relation to fire

Ignitibility to BS EN 14315-1 and BS EN 13823 (SBI) - Euroclass E-s3-d0 for 40 mm thickness.

Ignitibility to BS EN 13238 and BS EN ISO 11925-2 - surface flame propagation < 80 mm flame height in 30 s, edge flame < 100 mm flame height, turned around at 90 ° with foam edge exposed < 80 mm flame height, no flaming droplets/particles - pass.

Flammability - surface spread of flame to BS 476-7 - Class 1.

Reaction to fire performance classification to BS EN 13501-1 - Class E.

## 2.5 - ANCILLARY ITEMS

### Note:

Ancillary items detailed in this section may be used in conjunction with the Product but fall outside the scope the Agrément, include:

- double acting positive displacement piston metering pumps fitted with spray gun application equipment such as Graco, Gusmer, Glas-Craft;
- type HR underlay and Type LR underlay products;
- plastic ventilator spacer used at eaves and/or ridge to create a 50 mm ventilation gap between a Type HR underlay/sarking board and the Product;
- vapour control layer (VCL);
- gypsum plasterboard.

## CHAPTER 3 - CDM, NATIONAL BUILDING REGULATIONS AND THIRD-PARTY ACCEPTANCE

### 3.1 - THE CONSTRUCTION (DESIGN AND MANAGEMENT) REGULATIONS 2015 AND THE CONSTRUCTION (DESIGN AND MANAGEMENT) REGULATIONS (NORTHERN IRELAND) 2016

Information in this Agrément may assist the client, Principal Designer/CDM co-ordinator, designer and contractors to address their obligations under these Regulations.

### 3.2 - NATIONAL BUILDING REGULATIONS

In the opinion of Kiwa Ltd., the Product, if installed and used in accordance with Chapter 2 of this Agrément, can satisfy or contribute to satisfying the relevant requirements of the following national Building Regulations.

#### 3.2.1 - ENGLAND REQUIREMENTS: THE BUILDING REGULATIONS 2010 AND SUBSEQUENT AMENDMENTS

- C2(b) Resistance to moisture - the Product can adequately protect the building from precipitation
- C2(c) Resistance to moisture - the Product can adequately protect the building from condensation
- J4 Protection of building - the Product can be separated from hot appliances and surfaces to prevent the building catching fire
- L1A(a)(i)(ii) Conservation of fuel and power - the Product can limit heat gains and losses through thermal elements and pipes
- L1B(a)(i)(ii) Conservation of fuel and power - the Product can limit heat gains and losses through thermal elements and pipes
- Regulation 7(a) Materials and workmanship - the Product is appropriate for its use and can be adequately mixed and applied
- Regulation 23(1) Requirements relating to thermal elements - the Product can contribute to a roof complying with the requirements of L1A(a)(i)(ii) and L1B(a)(i)(ii)
- Regulation 26 - CO<sub>2</sub> emission rates for new buildings - the Product can contribute to the building not exceeding the target CO<sub>2</sub> emission rate
- Regulation 26A - Fabric energy efficiency rates - the Product can contribute to satisfying this Regulation

### 3.2.2 - WALES

#### REQUIREMENTS: THE BUILDING REGULATIONS 2010 AND SUBSEQUENT AMENDMENTS

- C2(b) Resistance to moisture - the Product can adequately protect the building from precipitation
- C2(c) Resistance to moisture - the Product can adequately protect the building from condensation
- J4 Protection of building - the Product can be separated from hot appliances and surfaces to prevent the building catching fire
- L1A(a)(i)(ii) Conservation of fuel and power - the Product can limit heat gains and losses through thermal elements and pipes
- L1B(a)(i)(ii) Conservation of fuel and power - the Product can limit heat gains and losses through thermal elements and pipes
- Regulation 7(a) Materials and workmanship - the Product is appropriate for its use and can be adequately mixed and applied
- Regulation 23(1) Requirements relating to thermal elements - the System can contribute to a roof complying with the requirements of L1A(a)(i)(ii) and L1B(a)(i)(ii)
- Regulation 26 - CO<sub>2</sub> emission rates for new buildings - the Product can contribute to the building not exceeding the target CO<sub>2</sub> emission rate
- Regulation 26A - Primary energy consumption rates for new buildings - the Product can contribute to a satisfying this Regulation
- Regulation 26B - Fabric performance values for new dwellings - the Product can contribute to a satisfying this Regulation

### 3.2.3 - SCOTLAND

#### REQUIREMENTS: THE BUILDING (SCOTLAND) REGULATIONS 2004 AND SUBSEQUENT AMENDMENTS

##### 3.2.3.1 Regulation 8(1)(2) Fitness and durability of materials and workmanship

- The Product is durable and fit for its intended purpose and can contribute to a construction to satisfy this Regulation

##### 3.2.3.2 Regulation 9 Building Standards - Construction

- 3.10 Precipitation - the Product can adequately protect the building from precipitation penetrating to the inner face of the building
- 3.15 Condensation - the Product will contribute to limiting the risk of surface and interstitial condensation
- 3.19 Combustion appliances - relationship to combustible materials - the Product can be separated from hot appliances and surfaces to prevent damage to the building
- 6.1(b) Carbon dioxide emissions - the Product will contribute to the building reducing carbon dioxide emissions
- 6.2 Building insulation envelope - the Product will contribute to the insulation envelope to resist thermal transfer
- 7.1(a)(b) Statement of sustainability - the Product can contribute to satisfying the relevant Requirements of Regulation 9, Standards 1 to 6, and therefore will contribute to a construction meeting a bronze level of sustainability as defined in this Standard; in addition, the Product can contribute to a construction meeting a higher level of sustainability as defined in this Standard

##### 3.2.3.3 Regulation 12 Building Standards - Conversions

- All comments given under Regulation 9 also apply to this Regulation, with reference to Schedule 6 of The Building (Scotland) Regulations 2004 and subsequent amendments, clause 0.12 of the Technical Handbook (Domestic)

### 3.2.4 - NORTHERN IRELAND

#### REQUIREMENTS: THE BUILDING REGULATIONS (NORTHERN IRELAND) 2012 AND SUBSEQUENT AMENDMENTS

- 23(a)(i)(ii)(iii)(iv)(b)(i)(ii) Fitness of materials and workmanship - the Product is of a suitable nature, can be adequately mixed and applied and acceptable for use as thermal insulation
- 28 Resistance to moisture and weather - the Product can protect the building from the passage of moisture from the weather
- 29 Condensation - the Product will contribute to limiting the risk interstitial condensation
- 39(a)(i) Conservation measures - the Product will limit heat gains and losses through thermal elements of the building
- 40(2) Target carbon dioxide emission rate - the Product will contribute to a building to not exceed its target carbon dioxide emission rate
- 73 Protection of people and buildings - the Product can be separated from hot appliances and surfaces to prevent damage to the building by heat or fire

### 3.3 - THIRD-PARTY ACCEPTANCE

**NHBC** - In the opinion of Kiwa BDA, the Product, if installed, used and maintained in accordance with this Agrément, can satisfy or contribute to satisfying the relevant requirements in relation to NHBC Standards, Chapter 7.2 Pitched roofs.

## CHAPTER 4 - SOURCES

- BS EN ISO 4590:2016 Rigid cellular plastics. Determination of the volume percentage of open cells and of closed cells
- BS EN ISO 6946:2017 Building components and building elements. Thermal resistance and thermal transmittance. Calculation methods
- BS EN ISO 10211:2017 Thermal bridges in building construction. Heat flows and surface temperatures. Detailed calculations
- BS EN ISO 10456:2007 Building materials and products. Hygrothermal properties. Tabulated design values and procedures for determining declared and design thermal values
- BS EN ISO 11925-2:2010 Reaction to fire tests. Ignitability of products subjected to direct impingement of flame. Single-flame source test
- BS EN ISO 13788:2012 Hygrothermal performance of building components and building elements. Internal surface temperature to avoid critical surface humidity and interstitial condensation. Calculation methods
- BS EN 1602:2013 Thermal insulating products for building applications. Determination of the apparent density
- BS EN 1604:2013 Thermal insulating products for building applications. Determination of dimensional stability under specified temperature and humidity conditions
- BS EN 1607:2013 Thermal insulating products for building applications. Determination of tensile strength perpendicular to faces
- BS EN 1609:2013 Thermal insulating products for building applications. Determination of short term water absorption by partial immersion
- BS EN 12086:2013 Thermal insulating products for building applications. Determination of water vapour transmission properties
- BS EN 12667:2001 Thermal performance of building materials and products. Determination of thermal resistance by means of guarded hot plate and heat flow meter methods. Products of high and medium thermal resistance
- BS EN 13172:2012 Thermal insulation products. Evaluation of conformity
- BS EN 13238:2010 Reaction to fire tests for building products. Conditioning procedures and general rules for selection of substrates
- BS EN 13501-1:2007+A1:2009 Fire classification of construction products and building elements. Classification using test data from reaction to fire tests
- BS EN 13823:2010+A1:2014 Reaction to fire tests for building products. Building products excluding floorings exposed to the thermal attack by a single burning item
- BS EN 14315-1:2013 Thermal insulating products for buildings. In-situ formed sprayed rigid polyurethane (PUR) and polyisocyanurate (PIR) foam products. Specification for the rigid foam spray system before installation
- BS EN 14315-2:2013 Thermal insulating products for buildings. In-situ formed sprayed rigid polyurethane (PUR) and polyisocyanurate (PIR) foam products. Specification for the installed insulation products
- BS EN 14318-1:2013 Thermal insulating products for buildings. In-situ formed dispensed rigid polyurethane (PUR) and polyisocyanurate (PIR) foam products. Specification for the rigid foam dispensed system before installation
- BS EN 15026:2007 Hygrothermal performance of building components and building elements. Assessment of moisture transfer by numerical simulation
- ISO 8301:1991 Ed 1 Thermal insulation. Determination of steady-state thermal resistance and related properties. Heat flow meter apparatus
- BS 476-3:2004 Fire tests on building materials and structures. Classification and method of test for external fire exposure to roofs
- BS 476-7:1997 Fire tests on building materials and structures. Method of test to determine the classification of the surface spread of flame of products
- BS 5250:2011+A1:2016 Code of practice for control of condensation in buildings
- BS 6093:2006+A1:2013 Design of joints and jointing in building construction. Guide
- BRE Information Paper 1/06:2006 Assessing the effects of thermal bridging at junctions and around openings
- BRE Report 262:2002 Thermal insulation: avoiding risks
- BRE Report 443:2006 Conventions for U-value calculations
- BRE Report 497:2016 Conventions for calculating linear thermal transmittance and temperature factors
- BRE Digest 369:1992 Interstitial condensation and fabric degradation
- PAS 2030:2017 Specification for the installation of energy efficiency measures in existing buildings. Building Fabric Measures (BFM)
- NHBC Standards 2018

**Remark:** apart from these sources confidential reports may also have been assessed; any relevant reports are in the possession of Kiwa Ltd. and kept in the Technical Assessment File of this Agrément; the Installation Guides are current at the time of publication and may be subject to change, the Agrément holder should be contacted for clarification of revision.

## CHAPTER 5 - AMENDMENT HISTORY

Revision	Amendment Description	Amended By	Approved By	Date
A	First issue	P Oakley	C Forshaw	December 2018