

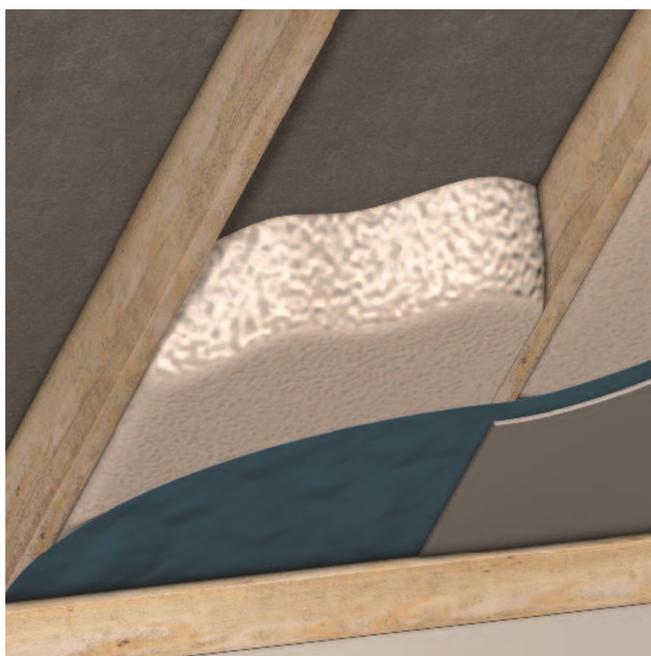
SCOPE OF AGRÉMENT

This Agrément relates to ENERTITE® OS 200 (hereinafter the 'Product'), an in-situ formed, water blown, spray-applied thermal insulation layer which contributes to the airtightness of roofs with a pitch greater than 15 °. The Product is for internal application to the underside of pitched roofs with Type LR breathable underlay (new build or retrofit), Type HR non-breathable underlay (retrofit) or sarking boards in loft and room in roof spaces of existing or new domestic buildings in the UK.

PRODUCT DESCRIPTION

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

PRODUCT ILLUSTRATION



THIRD-PARTY ACCEPTANCE

None requested by the Agrément holder.

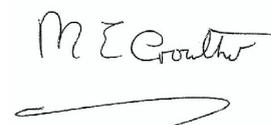
STATEMENT

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.

Chris Vurley, CEng
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;
- Production Control, Quality Management System and the Annual Verification procedure;
- Product components and ancillary items, 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, as appropriate;
- Sources.

MAJOR POINTS OF ASSESSMENT

Thermal Performance - the Product improves the thermal insulation of a roof and has a declared aged thermal conductivity (λ_D) of 0.039 W/mK* (see section 2.2.9).

Moisture Control - the Product (see section 2.1.10):

- has a low volume closed cell percentage;
- has low water vapour transmission resistance;
- can contribute to limiting the risk of interstitial and surface condensation;
- is not resistant to water penetration.

Fire Performance - the Product is classified as Euroclass F (combustible) in accordance with BS EN 13501-1 (see section 2.2.11).

Durability - the Product will have a service life equivalent to that of the roof structure in which it is incorporated (see section 2.2.12).

CE Marking - the Agrément holder has responsibility for CE marking in accordance with all relevant harmonised European Product Standards (see section 2.2.13).

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CHAPTER 1 - GENERAL CONSIDERATIONS

1.1 - CONDITIONS OF USE

1.1.1 Design considerations

See section 2.2.

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 relevant test reports, technical literature, the Agrément holder's quality plan, DoPs and site visit as appropriate.

1.1.4 Installation supervision

The quality of installation and workmanship must be controlled by a competent person who must be an employee of the installation company.

The Product must be installed strictly in accordance with the instructions 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.

1.2 - PRODUCTION CONTROL AND QUALITY MANAGEMENT SYSTEM

Kiwa Ltd. has determined that the Agrément holder fulfils all obligations in relation to this Agrément, in respect of the Product.

The initial audit demonstrated that the Agrément holder has a satisfactory Quality Management System (QMS) and is committed to continuously improving their quality plan. Document control and record keeping procedures were deemed satisfactory. A detailed Production Quality Specification (PQS) has been compiled to ensure traceability and compliance under the terms of this Agrément.

1.3 - ANNUAL VERIFICATION PROCEDURE - CONTINUOUS SURVEILLANCE

To demonstrate that the Product is in conformity with the requirements of the technical specification described in this Agrément, an Annual Verification procedure has been agreed with the Agrément holder in respect of continuous surveillance and assessment, and auditing of the Agrément holder's QMS.

This Agrément does not constitute a design guide for the Product. It is intended as an assessment of fitness for purpose only.

2.1 - ANCILLARY ITEMS

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

- spray machinery including plural component proportioners (double-acting positive displacement piston metering pumps) fitted with spray gun application equipment;
- Type HR non-breathable underlay and Type LR breathable underlay;
- corrugated cardboard rafter slide (water vapour permeable), fitted between rafters to create a 50 mm ventilation gap between the underlay/sarking board and the Product;
- plastic ventilator spacer used at eaves and/or ridge to create a 50 mm ventilation gap between the Type HR non-breathable underlay/sarking board and the Product;
- vapour control layer (hereinafter 'VCL');
- lining boards.

2.2 - POINTS OF ATTENTION TO THE SPECIFIER

2.2.1 Design responsibility

A Specifier may undertake a project specific design in which case it is recommended that the Specifier co-operates closely with the Agrément holder. The Specifier or installing contractor is responsible for the final as-built design.

2.2.2 Applied building physics (heat, air, moisture)

A competent specialist shall check the physical behaviour of a project specific design incorporating the Product and if necessary can offer advice in respect of improvements to achieve the final specification. The Specialist can be either a qualified employee of the Agrément holder or a suitably qualified consultant (in which case it is recommended that the consultant Specialist co-operates closely with the Agrément holder).

2.2.3 General design considerations

The Product can be used as insulation in the following applications:

- habitable warm pitched roof (room in roof) between, or between and under timber rafters. Insulation at rafter level only, with or without counter battens;
- non-habitable warm pitched roof (loft space) between, or between and under timber rafters. Insulation at rafter level only, with or without counter battens;
- ventilated non-habitable cold pitched roof (loft space) between, or between and over, timber ceiling joists. Insulation at ceiling level only.

The Product can be applied directly to a roof construction incorporating Type LR breathable underlay, Type HR non-breathable underlay or sarking boards. When applied to a roof construction incorporating Type HR non-breathable underlay or sarking boards, ventilation requirements must be considered.

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.

Care is needed for design at openings, and the correct level of workmanship and design detailing of joints, particularly around rooflight and flue pipe openings, should be in accordance with BS 6093.

A suitable VCL incorporating lapped and sealed joints must be applied behind the lining board in pitched roofs, unless an assessment to BS 5250 indicates that it is not necessary.

Ventilation openings should be arranged to prevent the ingress of rain, snow, birds and small animals and the risk of 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.

The Product shall not be applied over junctions between roofs and compartment walls or external walls required to provide a minimum period of fire resistance. Care must be taken to ensure continuity of fire resistance at junctions and be continued across any eaves with fire-resisting elements, in accordance with the national Building Regulations.

Cavity barriers should be provided at the edges of cavities, including around rooflights and service penetrations, with fire-resisting elements, in accordance with the relevant provisions of the national Building Regulations.

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 that incorporate a protective fire hood.

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

The Product is an open 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.

New build design considerations

New roofs should be designed and constructed to prevent moisture ingress and air infiltration. 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 Type LR breathable underlay according to the requirements of BS 5250.

Retrofit design considerations

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

2.2.4 Project specific design considerations

A pre-installation survey is required to allow determination of the project specific design - see section 2.4.3.

2.2.5 Permitted applications

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

2.2.6 Installer competence level

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

Installation shall be by approved installation companies who are members of the BASF FoamMasters Scheme.

2.2.7 Delivery, storage and site handling

The Product is delivered to site in suitable containers, that bear the Product name, the Agrément holder's name and the BDA Agrément® logo incorporating the number of this Agrément.

Store the Product in accordance with the Agrément holder's requirements. Particular care must be taken to:

- avoid exposure to direct sunlight for extended periods of time;
- avoid exposure to high or low temperatures for extended periods of time;
- store in a well-ventilated covered area to protect from rain, frost and humidity;
- store away from possible ignition sources.

The drums containing the Product should be stored indoors between 10 °C and 37 °C.

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. Ventilate and vacate the installed space for 24 hours subsequent to installation to prevent the inhalation of isocyanate vapour. When cured, the Product is non-hazardous.

2.2.8 Maintenance and repair

Once installed, the Product does not require regular maintenance provided the weathertightness of the roof is maintained. Damaged or poorly applied Product should be removed from the affected area using a hand saw. New Product should then be applied. For advice in respect of repair, consult the Agrément holder.

Performance factors in relation to the Major Points of Assessment

2.2.9 Thermal Performance

Thermal conductivity

Due to the nature of the open cell structure of the Product, it has a high air content and has adequate thermal resistance.

For the purpose of U-value calculations and to determine if the requirements of the national Building Regulations are met, the thermal resistance and U-value of pitched 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 (λ_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, increased insulation thickness may be required.

Account should be taken of the applicable Government Accredited Construction details for Part L, England and Wales, and Accredited Construction details, Scotland.

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.

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

2.2.10 Moisture Control

Cell structure

The Product has a very low volume closed cell percentage (3.2 %), in accordance with BS EN ISO 4590.

Water vapour transmission resistance

The Product has low water vapour transmission resistance (high level of water vapour permeability) 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 VCLs (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 open cell structure means the Product is not water-resistant.

The Product has low resistance to short-term water absorption by partial immersion in accordance with BS EN 1609, Method A.

2.2.11 Fire Performance

The Product is classified as Euroclass F (combustible), in accordance with BS EN 13501-1.

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

The Product must be suitably separated from any potential source of ignition.

The exposed Product has the potential to contribute to the development stages of a fire.

Once installed, except for non-habitable roof applications, the Product must be contained by a suitable lining board fixed to battens or rafters and with all joints taped, sealed and supported by rafters, noggins or battens.

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.

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 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 insulating material in accordance with the provisions of the national Building Regulations.

2.2.12 Durability

The Product will have a service life durability equivalent to that of the structure into which it is incorporated.

The Product is inert once cured and is therefore chemically inactive. The Product does not encourage corrosion on metals. Due to the good adhesion, moisture does not build up on metal substrates. No corrosive substances are released for the cured Product.

2.2.13 CE Marking

The harmonised European standard for the Product is BS EN 14315-1.

2.3 - EXAMPLES OF TYPICAL DETAILS

Diagram 1 - Detail of pitched roof with rafter slide

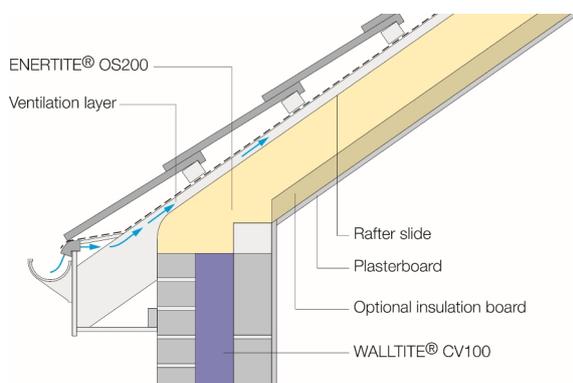
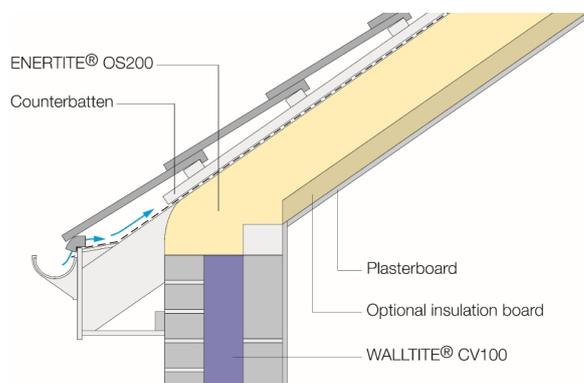


Diagram 2 - Detail of pitched roof with counter battens



The Product must be installed strictly in accordance with the instructions (hereinafter 'Installation Manual') of the Agrément holder and the requirements of this Agrément.

2.4.1 Installer competence level

See section 2.2.6.

2.4.2 Delivery, storage and site handling

See section 2.2.7.

2.4.3 Project specific installation considerations

The project specific design has been determined from a pre-installation survey.

The primary requirement of the pre-installation survey is to determine the following:

- the external condition of the roof, valleys, gutters, chimney stacks, flashings etc;
- there is no existing rain ingress and there are no signs of dampness, staining or condensation on the internal face of the roof;
- the type, suitability and condition of roof timbers;
- the type and condition of any sarking boards or breather membrane present;
- roof space ventilation requirements;
- the location of expansion joints;
- areas not to be sprayed.

2.4.4 Preparation

The following works must be undertaken prior to the installation of the Product:

- the substrates must be clean, dry and free from dirt, dust, grease, oils and loose particles/torching;
- a small adhesion test should be made to the substrate 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.

2.4.5 Outline installation procedure

The detailed installation sequence can be found in full in the Agrément holder's Installation Manual.

Installation of the Product shall be carried out in accordance with BS 8000-0, BS EN 14315-1 and BS EN 14315-2.

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

Do not apply the Product in thicknesses of greater than 152 mm per pass.

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 including nitrile gloves, disposable overalls and full-face mask (with A2P3 filters) air-fed from NIOSH approved pumping equipment.

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 with overspray during application and should not be removed for 24 hours.

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

The moisture content of the surfaces of porous materials (including concrete) should not exceed 20 % before application commences. 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 low adhesion to the substrate.

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.

The spraying machine must be specially designed to mix and spray the Product via a spray gun. The Product is applied with volumetric displacement pumps with fixed mixing ratio A/B = 1/1 by volume. 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.

Components A and B must not be used when their temperature is below 10 °C. For the supply pumps to operate properly, the temperature of both components must be a minimum of 18 °C.

The spraying machine must have a temperature controller in the pre-heaters and hoses. The working temperature must be set between 49 °C and 54 °C, depending on the ambient temperature conditions. Higher temperatures up to 60 °C may be required in cold conditions.

A VCL may not always be required such as when the Product is installed between the rafters left exposed in a non-habitable roof void. During spraying, the ambient air temperature and substrate temperature must ideally be between 5 °C and 40 °C. An infrared or contact thermometer can be used for checking substrate surface temperature.

Due to the short reaction time, the spraying can be performed 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 2 m and protected by heat blankets.

Self-verification quality control checks provided for in BS EN 14315-2 must be carried out by the installer in respect of core density, appearance and thickness.

Initial set-up

1. set the appropriate temperature and pressure parameters to guarantee the mixing quality of the Product and select a suitable spraying nozzle;
2. carry out quality control tests to check for a round spray pattern, sticky patches, light or dark patches/streaks, no voids, consistent colour, appearance, reaction profile - cream time, gel time, tack-free time and free-rise density - using test methods in accordance with BS EN 14315-1;
3. interlaminar adhesion shall be checked on a two-layer spray sample.

Pitched roof - insulation on slope with Type LR breathable underlay (counter-battened)

Where a counter-batten is fitted between the Type LR breathable underlay and tiling/slating battens, the Product should be applied directly to the Type LR breathable underlay.

In accordance with BS 5250 high-level ridge ventilation is required at a rate of 5,000 mm²/m of ridge run; eaves ventilation is required at a rate of 25,000 mm²/m of eaves run.

Pitched roof - insulation on slope with Type LR breathable underlay

Where a breathable rafter slide is installed to provide a ventilated separation layer between the Type LR breathable underlay and the Product, the Product should be applied directly to the rafter slide.

In accordance with BS 5250 high-level ridge ventilation is required at a rate of 5,000 mm²/m of ridge run; eaves ventilation is required at a rate of 25,000 mm²/m of eaves run.

Pitched roof - insulation on slope with Type HR non-breathable underlay

Where a breathable rafter slide is installed to provide a ventilated separation layer between the Type HR non-breathable underlay and the Product, the Product should be applied directly to the rafter slide.

In accordance with BS 5250 high-level ridge ventilation is required at a rate of 5,000 mm²/m of ridge run; eaves ventilation is required at a rate of 25,000 mm²/m of eaves run.

Pitched roof - insulation along ceiling line

The Product should be applied between ceiling joists to the lining board. Down-lighter covers should be used where necessary, to prevent the Product from encapsulating the light fitting. Timber joists should not be covered and should be counter battened where required to allow for a hard-standing area.

In accordance with BS 5250 high-level ridge ventilation is required at a rate of 5,000 mm²/m of ridge run; eaves ventilation is required at a rate of 10,000 mm²/m of eaves run.

2.4.6 Finishing

The following finishing is required upon completion of the installation:

- the Product should be cured and cold prior to undertaking any finishing work;
- when cured any excess foam can be shaved flush with the adjacent timber rafters to allow for fitting of a lining board with vapour barrier by others;
- in habitable pitched roof space, the Product must be covered by a suitable lining board, with all joints taped, sealed and supported by rafters, noggins or battens;
- in roof spaces where the Product is left exposed, fire warning labels must be placed in prominent positions.

2.5 - INDEPENDENTLY ASSESSED PRODUCT CHARACTERISTICS

2.5.1 Thermal performance

Test	Test Standard	Result
Declared aged thermal conductivity (λ_D)	BS EN 12667	0.039 W/mK*

2.5.2 Moisture control

Test	Test Standard	Result	
Cell structure	Open and closed cell volume	BS EN ISO 4590	3.2 % closed cells (mean)
Water vapour transmission	Water vapour transmission rate	BS EN 12086, Method A	6023.9 mg/(m ² .h)
	Water vapour resistivity		16.7 MNs/gm
	Water vapour diffusion resistance factor (μ)		3.3
Water absorption	Short-term water absorption	BS EN 1609, Method A	1.143 Kg/m ² (Side A - mean) 1.082 Kg/m ² (Side B - mean)

2.5.3 Fire Performance

Test	Standard	Result
Reaction to fire	BS EN 13501-1	F

The REACH Statement for the Product in respect of dangerous substances confirms no hazardous materials are present.

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 - THE 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 THE BUILDING REGULATIONS 2010 AND SUBSEQUENT AMENDMENTS

- C2(c) Resistance to moisture - a roof incorporating the Product can adequately protect a building from condensation
- J4 Protection of building - the Product can be separated from hot appliances and surfaces to prevent a building catching fire
- L1(a)(i) Conservation of fuel and power - the Product can limit heat gains and losses through a roof
- Regulation 7(1)(a) Materials and workmanship - the Product is an adequate and proper material
- Regulation 23(1) Requirements relating to thermal elements - the Product can contribute to a roof complying with the requirements of L1(a)(i)
- Regulation 26 - CO₂ emission rates for new buildings - the Product can contribute to a building to not exceed its CO₂ emission rate
- Regulation 26A - Fabric energy efficiency rates - the Product can contribute to satisfying this Requirement

3.2.2 - WALES THE BUILDING REGULATIONS 2010 AND SUBSEQUENT AMENDMENTS

- C2(c) Resistance to moisture - a roof incorporating the Product can adequately protect a building from condensation
- J4 Protection of building - the Product can be separated from hot appliances and surfaces, to prevent a building catching fire
- L1(a)(i) Conservation of fuel and power - the Product can limit heat gains and losses through a roof
- Regulation 7(1)(a) Materials and workmanship - the Product is an adequate and proper material
- Regulation 23(1) Requirements relating to thermal elements - the Product can contribute to a roof complying with the requirements of L1(a)(i)
- Regulation 26 - CO₂ emission rates for new buildings - the Product can contribute to a building to not exceed its CO₂ 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 satisfying this Requirement

3.2.3 - SCOTLAND THE BUILDING (SCOTLAND) REGULATIONS 2004 AND SUBSEQUENT AMENDMENTS

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

- The Product is durable and fit for its intended purpose

3.2.3.2 Regulation 9 Building standards - construction

- 3.15 Condensation - the roof incorporating the Product can contribute to limiting surface or interstitial condensation
- 3.19 Combustion appliances - relationship to combustible materials - the Product can be separated from hot appliances and surfaces to prevent damage to a building
- 6.1(b) Carbon dioxide emissions - the Product will contribute to energy conservation of a building
- 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

3.2.4 - NORTHERN IRELAND THE BUILDING REGULATIONS (NORTHERN IRELAND) 2012 AND SUBSEQUENT AMENDMENTS

- 23(a)(b) Fitness of materials and workmanship - the Product is suitable and can be adequately mixed, prepared and applied
- 29 Condensation - the Product can contribute to limiting interstitial condensation in a building
- 39(a)(i) Conservation measures - the Product will limit heat gains and losses through a roof
- 40(2) Target carbon dioxide emission rate - the Product will contribute to a building to not exceed its target CO₂ emission rate
- 73(1)(b) Protection of people and buildings - the Product can be separated from hot appliances and surfaces to prevent damage to a building by heat or fire

3.3 - THIRD-PARTY ACCEPTANCE

None requested by the Agrément holder.

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 9001:2015 Quality management systems. Requirements
- 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 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 13501-1:2018 Fire classification of construction products and building elements. Classification using test data from reaction to fire tests
- 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 476-3:2004 Fire tests on building materials and structures. Classification and method of test for external fire exposure to roofs
- 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 Digest 369:2016 Condensation and dampness
- 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
- PAS 2030:2017 Specification for the installation of energy efficiency measures in existing buildings. Building Fabric Measures (BFM)

Remark: apart from these sources, technical information and confidential reports have been assessed; any relevant documents are in the possession of Kiwa Ltd. and kept in the Technical Assessment File of this Agrément. The Installation Manual for the Product 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
-	First Issue	C Vurley	C Forshaw	February 2020

CHAPTER 6 - CONDITIONS OF USE

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For full terms and conditions refer to Kiwa Ltd.

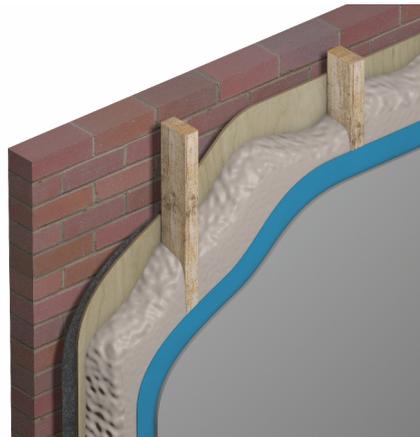
SCOPE OF AGRÉMENT

This Agrément relates to ENERTITE® OS 200 (hereinafter the 'Product'), an in-situ formed, water blown, spray-applied thermal insulation layer which contributes to the airtightness of external timber framed walls with outer masonry leaf and solid masonry walls. The Product is for internal application directly to sheathed timber framed walls to fill the void between studs, and on the inside face of external solid masonry walls up to and including 12 m in height, in room spaces of existing or new domestic and non-domestic buildings in the UK. The Product may also be used in walls above 12 m in height (up to 18 m), where a building has been assessed as suitable by the Agrément holder.

PRODUCT DESCRIPTION

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

PRODUCT ILLUSTRATION



THIRD-PARTY ACCEPTANCE

None requested by the Agrément holder.

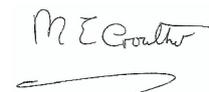
STATEMENT

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.

Chris Vurley, CEng
Technical Manager, Building Products



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



SUMMARY OF AGREEMENT

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 Agreement covers the following:

- Conditions of use;
- Production Control, Quality Management System and the Annual Verification procedure;
- Product components and ancillary items, 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, as appropriate;
- Sources.

MAJOR POINTS OF ASSESSMENT

Thermal performance - the Product improves the thermal insulation of timber framed walls and solid masonry walls and has a declared aged thermal conductivity (λ_b) of 0.039 W/mK* (see section 2.2.9).

Moisture control - the Product (see section 2.2.10):

- has a low volume closed cell percentage;
- has low water vapour transmission resistance;
- can contribute to limiting the risk of interstitial and surface condensation;
- is not resistant to water penetration.

Fire performance - the Product is classified as Euroclass F (combustible) in accordance with BS EN 13501-1 (see section 2.2.11).

Durability - the Product will have a service life equivalent to that of the timber framed wall or solid masonry wall in which it is incorporated (see section 2.2.12).

CE Marking - the Agreement holder has responsibility for CE marking in accordance with all relevant harmonised European Product Standards (see section 2.2.13).

CONTENTS

Chapter 1 - General considerations

- 1.1 - Conditions of use
- 1.2 - Production Control and Quality Management System
- 1.3 - Annual verification procedure - continuous surveillance

Chapter 2 - Technical assessment

- 2.1 - Product components and ancillary items
- 2.2 - Points of attention to the Specifier
- 2.3 - Examples of details
- 2.4 - Installation
- 2.5 - Independently assessed Product characteristics

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
- 3.2 - The national Building Regulations
- 3.3 - Third-Party acceptance

Chapter 4 - Sources

Chapter 5 - Amendment history

Chapter 6 - Conditions of use

CHAPTER 1 - GENERAL CONSIDERATIONS

1.1 - CONDITIONS OF USE

1.1.1 Design considerations

See section 2.2.

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 relevant test reports, technical literature, the Agrément holder's quality plan, DoPs and site visit as appropriate.

1.1.4 Installation supervision

The quality of installation and workmanship must be controlled by a competent person who must be an employee of the installation company.

The Product must be installed strictly in accordance with the instructions 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.

1.2 - PRODUCTION CONTROL AND QUALITY MANAGEMENT SYSTEM

Kiwa Ltd. has determined that the Agrément holder fulfils all obligations in relation to this Agrément, in respect of the Product.

The initial audit demonstrated that the Agrément holder has a satisfactory Quality Management System (QMS) and is committed to continuously improving their quality plan. Document control and record keeping procedures were deemed satisfactory. A detailed Production Quality Specification (PQS) has been compiled to ensure traceability and compliance under the terms of this Agrément.

1.3 - ANNUAL VERIFICATION PROCEDURE - CONTINUOUS SURVEILLANCE

To demonstrate that the Product is in conformity with the requirements of the technical specification described in this Agrément, an Annual Verification procedure has been agreed with the Agrément holder in respect of continuous surveillance and assessment, and auditing of the Agrément holder's QMS.

This Agrément does not constitute a design guide for the Product. It is intended as an assessment of fitness for purpose only.

2.1 - ANCILLARY ITEMS

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

- spray machinery including plural component proportioners (double-acting positive displacement piston metering pumps) fitted with spray gun application equipment;
- Type LR breather membrane;
- vapour control layer (hereinafter 'VCL');
- plugs of mineral wool;
- lining boards.

2.2 - POINTS OF ATTENTION TO THE SPECIFIER

2.2.1 Design responsibility

A Specifier may undertake a project specific design in which case it is recommended that the Specifier co-operates closely with the Agrément holder. The Specifier or installing contractor is responsible for the final as-built design.

2.2.2 Applied building physics (heat, air, moisture)

A competent specialist shall check the physical behaviour of a project specific design incorporating the Product and if necessary can offer advice in respect of improvements to achieve the final specification. The Specialist can be either a qualified employee of the Agrément holder or a suitably qualified consultant (in which case it is recommended that the consultant Specialist co-operates closely with the Agrément holder).

2.2.3 General design considerations

The Product can be used as insulation in the following applications:

- upgrade of walls with existing insulation between studs to meet current U-value requirements;
- treatment of surfaces with restricted access or curved features;
- to remain exposed after treatment in non-habitable room spaces or covered by plasterboard lining in habitable rooms combined with adequate ventilation and a vapour check layer.

A cavity of 50 mm minimum width must be maintained between a timber framed wall and outer masonry leaf.

The Product can be used in breathable and non-breathable walls where a condensation risk analysis has been completed and a suitable VCL is used.

Where a room space is being converted into a heated habitable room, the Product can be applied directly to Type LR breather membrane or sheathing boards where a suitable VCL is used behind a plasterboard lining.

Where the Product is applied to the inside of breather membrane/sheathing boards, the ventilation strategy shall be in accordance with the guidance in BS 5250.

Care is needed for design detailing of joints at windows and doors, and the correct level of workmanship and design detailing of joints, particularly around flue pipe openings, and should be in accordance with BS 6093.

A suitable VCL incorporating lapped and sealed joints shall be applied behind a lining board, unless an assessment to BS 5250 indicates that it is not necessary.

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

For habitable room spaces, the Product shall be covered by a wall plasterboard lining fixed to studs or battens and with all joints taped/sealed to give a minimum 30-minute fire rating.

The Product shall not be applied over junctions with roofs required to provide a minimum period of fire resistance. Care shall be taken to ensure continuity of fire resistance at junctions with fire-resisting elements, in accordance with the national Building Regulations.

External framed walls shall incorporate cavity barriers at edges, around openings, penetrations, at junctions with roof or floor cavities and in extensive cavities with fire-resisting elements in accordance with the relevant provisions of the national Building Regulations.

The Product shall be separated by 8 cm from any heat emitting device and any potential source of ignition, where the temperature is > 82 °C.

Do not apply the Product over electrical cables, existing vents or ventilation gaps. Consider re-routing, re-laying in conduit or trunking, or de-rating electrical cables.

The Product is an open 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.

Retrofit design considerations

Existing framed and solid walls shall be in a good state of repair with no signs of rain penetration or damp. Any necessary repairs shall be carried out prior to installation.

New build design considerations

New timber framed walls with outer masonry leaf and external masonry solid walls should be designed and constructed in accordance with the national Building Regulations and the relevant timber, steel and concrete Eurocodes, BS Standards and Codes of Practice, for the site exposure zone and wind-driven rain index in accordance with BS 8104 to prevent moisture ingress and air infiltration.

2.2.4 Project specific design considerations

A pre-installation survey is required to allow determination of the project specific design - see section 2.4.3.

2.2.5 Permitted applications

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

2.2.6 Installer competence level

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

Installation shall be by approved installation companies who are members of the BASF FoamMasters Scheme.

2.2.7 Delivery, storage and site handling

The Product is delivered to site in suitable containers, that bear the Product name, the Agrément holder's name and the BDA Agrément® logo incorporating the number of this Agrément.

Store the Product in accordance with the Agrément holder's requirements. Particular care must be taken to:

- avoid exposure to direct sunlight for extended periods of time;
- avoid exposure to high or low temperatures for extended periods of time;
- store in a well-ventilated covered area to protect from rain, frost and humidity;
- store away from possible ignition sources.

The drums containing the Product should be stored indoors between 10 °C and 37 °C.

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. Ventilate and vacate the installed space for 24 hours subsequent to installation to prevent the inhalation of isocyanate vapour. When cured, the Product is non-hazardous.

2.2.8 Maintenance and repair

Once installed, the Product does not require regular maintenance provided the weathertightness of the wall is maintained. Damaged or poorly applied Product should be removed from the affected area using a hand saw. New Product should then be applied. For advice in respect of repair, consult the Agrément holder.

Performance factors in relation to the Major Points of Assessment

2.2.9 Thermal performance

Thermal conductivity

Due to the nature of the open cell structure of the Product, it has a high air content and has adequate thermal resistance.

For the purpose of U-value calculations and to determine if the requirements of the national Building Regulations are met, the thermal resistance and U-value of external framed walls and solid masonry walls 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 (λ_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, increased insulation thickness may be required.

Account should be taken of the applicable Government Accredited Construction details for Part L, England and Wales, Accredited Construction Details, Scotland and energy measures in PAS 2030 and PAS 2035.

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 wall 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.

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

2.2.10 Moisture control

Cell structure

The Product has a very low volume closed cell percentage (3.2 %), in accordance with BS EN ISO 4590.

Water vapour transmission resistance

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

Condensation risk

External walls incorporating the Product can adequately limit the risk of interstitial and surface condensation when designed in accordance with BS 5250 and BRE Report 262. Room spaces should be ventilated in accordance with BS 5250. Care should be taken to provide adequate trickle ventilation, particularly in rooms expected to experience high humidity, and to ensure the integrity of VCLs (where installed) and plasterboard wall 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 open cell structure means the Product is not water-resistant.

Any rain water ingress through the outer masonry will drain down a partially ventilated cavity and evaporate. The sheathed timber frame is protected by a breather membrane.

The Product has low resistance to water absorption by immersion in accordance with BS EN 1609, Method A.

2.2.11 Fire performance

The Product is classified as Euroclass F (combustible), in accordance with BS EN 13501-1.

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

The Product must be suitably separated from any potential source of ignition.

The exposed Product has the potential to contribute to the development stages of a fire.

In habitable rooms where the Product is covered by plasterboard, the Product will not contribute to the development stages of a fire.

External framed walls shall incorporate cavity barriers at edges, around openings, penetrations, at junctions with roof or floor cavities and in extensive cavities with fire-resisting elements in accordance with the relevant provisions of the national Building Regulations.

The use of the Product in external walls should not affect the external fire exposure classification when evaluated by assessment or test to BS 476-21.

Proximity of flues and appliances

The installed Product shall be separated or shielded from any heat-emitting fixed combustion appliances, fireplaces, chimneys, or flue pipes passing through a wall and any potential source of ignition where temperature is in excess of 70 °C, by non-combustible insulation in accordance with the provisions of the national Building Regulations.

2.2.12 Durability

The Product will have a service life durability equivalent to that of the structure into which it is incorporated.

The Product is inert once cured and is therefore chemically inactive. The Product does not encourage corrosion on metals. Due to the good adhesion, moisture does not build up on metal substrates. No corrosive substances are released for the cured Product.

2.2.13 CE Marking

The harmonised European standard for the Product is BS EN 14315-1.

2.3 - EXAMPLES OF TYPICAL DETAILS

Diagram 1 - External corner plan detail

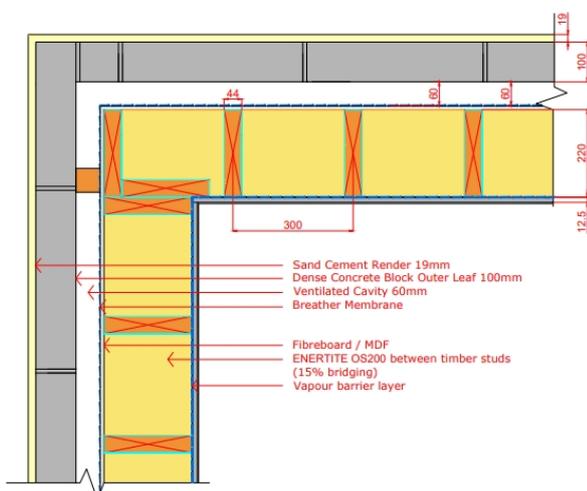


Diagram 2 - Timber wall plan

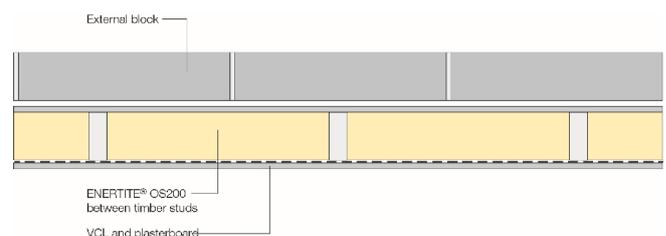


Diagram 3 - Refurbished masonry

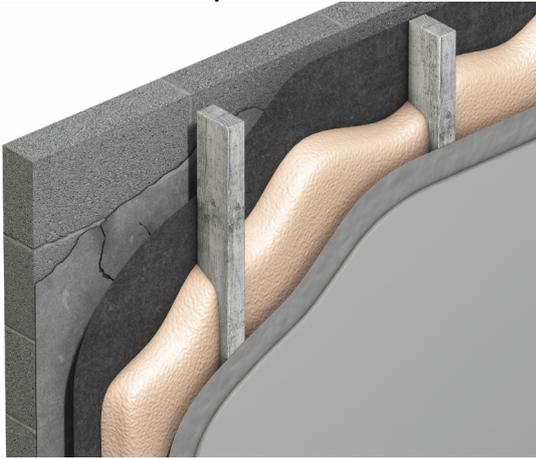
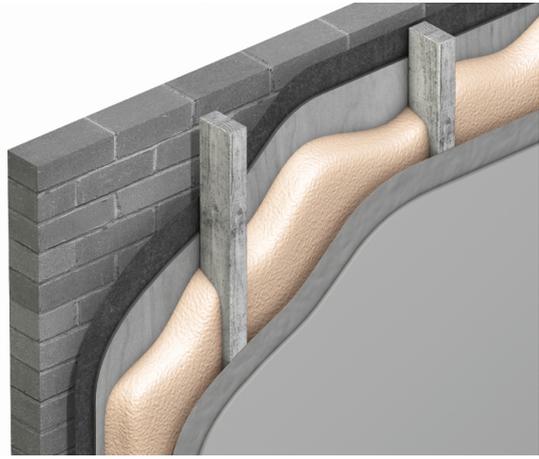


Diagram 4 - Timber frame wall



2.4 - INSTALLATION

The Product must be installed strictly in accordance with the instructions (hereinafter 'Installation Manual') of the Agrément holder and the requirements of this Agrément.

2.4.1 Installer competence level

See section 2.2.6.

2.4.2 Delivery, storage and site handling

See section 2.2.7.

2.4.3 Project specific installation considerations

The project specific design has been determined from a pre-installation survey.

The primary requirement of the pre-installation survey is to determine the following:

- the external condition of a framed or solid wall, gutters, chimney stack, flashings etc.;
- there is no existing rain ingress, dampness, staining or condensation on external face of timber sheathing;
- there are no signs of dampness, staining or condensation on the internal face of a solid masonry wall in accordance with BS 6576;
- existing masonry and timber frame cavity wall are structurally sound;
- the type and condition of timber studs and any openings;
- the type and condition of sheathing boards and any breather membrane present;
- stud void ventilation requirements;
- room space ventilation requirements;
- areas not to be sprayed.

2.4.4 Preparation

The following works shall be undertaken before the installation of the Product:

- the substrate must be clean, dry and free from dirt, dust, grease, oils and loose particles/torching;
- a small adhesion test should be made to the substrate to guarantee good bonding, especially on metal surfaces. This will determine if a primer is required for maximum adhesion;
- any necessary repairs to external walls, such as replacing damp or broken/rotten window/door frame timbers;
- repair any damaged gutters and flashings;
- any timber treatment carried out;
- make external walls weather-tight before application of the Product;
- sleeve or close air vents to prevent blockage by the insulant;
- services e.g. electrical cables may need re-routing or trunking;
- isolate heat-emitting pipes, flues, devices by applying non-combustible thermal insulation material around them;
- cover front faces of surfaces not to be sprayed, e.g. exposed studs;
- cover services, e.g. electrical cables and pipes.

2.4.5 Outline installation procedure

The detailed installation sequence can be found in full in the Agrément holder's Installation Manual.

Installation of the Product shall be carried out in accordance with BS 8000-0 and BS EN 14315-2.

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

Do not apply the Product in thicknesses of greater than 152 mm per pass.

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.

A VCL may not always be required such as when the Product is installed between studs in a non-habitable room space.

Application of the Product may produce a build-up of harmful vapours. Installers must wear personal protection equipment (PPE) when working with the Product including nitrile gloves, disposable overalls and full-face mask (with A2P3 filters) air-fed from NIOSH approved pumping equipment.

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.

The moisture content of the surfaces of porous materials (including concrete) should not exceed 20 % before application commences. 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 low adhesion to the substrate.

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.

The spraying machine must be specially designed to mix and spray the Product via a spray gun. The Product is applied with volumetric displacement pumps with fixed mixing ratio A/B = 1/1 by volume. 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.

Components A and B must not be used when their temperature is below 10 °C. For the supply pumps to operate properly, the temperature of both components must be a minimum of 18 °C.

The spraying machine must have a temperature controller in the pre-heaters and hoses. The working temperature must be set between 49 °C and 54 °C, depending on the ambient temperature conditions. Higher temperatures up to 60 °C may be required in cold conditions.

During spraying, the ambient air temperature and substrate temperature must ideally be between 5 °C and 40 °C. An infrared or contact thermometer can be used for checking substrate surface temperature.

Due to the short reaction time, the spraying can be performed 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 2 m and protected by heat blankets.

Self-verification quality control checks provided for in BS EN 14315-2 must be carried out by the installer in respect of core density, appearance and thickness.

Initial setup

1. set the appropriate temperature and pressure parameters to guarantee the mixing quality of the Product and select a suitable spraying nozzle;
2. carry out quality control tests to check for a round spray pattern, sticky patches, light or dark patches/streaks, no voids, consistent colour, appearance, reaction profile - cream time, gel time, tack-free time, free-rise density - using test methods in accordance with BS EN 14315-1;
3. interlaminar adhesion shall be checked on a two-layer spray sample.

Timber framed walls

The Product should be applied between studwork to OSB or plywood board.

Drylining - masonry walls

The Product should be applied to dry internal masonry surfaces between timber studwork fitted at 600 mm centres.

2.4.6 Finishing

The following finishing is required upon completion of the installation:

- the Product should be cured and cold prior to undertaking any finishing work;
- when cured any excess foam can be shaved flush with adjacent studwork to allow for fixing of lining board a vapour barrier as required.
- in habitable rooms, the Product shall be covered by a plasterboard lining, with all joints taped, sealed and supported by studs, noggins or battens;
- in non-habitable room spaces where the Product is left exposed, fire warning labels shall be placed in prominent positions.

2.5 - INDEPENDENTLY ASSESSED PRODUCT CHARACTERISTICS

2.5.1 Thermal performance

Test	Test Standard	Result
Declared aged thermal conductivity (λ_D)	BS EN 12667	0.039 W/mK*

2.5.2 Moisture control

Test	Test Standard	Result
Cell structure	Open and closed cell volume	BS EN ISO 4590
Water vapour transmission	Water vapour transmission rate	3.2 % closed cells (mean)
	Water vapour resistivity	6023.9 mg/(m ² .h)
	Water vapour diffusion resistance factor (μ)	16.7 MNs/gm
Water absorption	Short-term water absorption	3.3
		BS EN 1609, Method A

2.5.3 Fire Performance

Test	Standard	Result
Reaction to fire	BS EN 13501-1	F

The REACH Statement for the Product in respect of dangerous substances confirms no hazardous materials are present.

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 - THE 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 THE BUILDING REGULATIONS 2010 AND SUBSEQUENT AMENDMENTS

- C2(c) Resistance to moisture - a wall incorporating the Product can adequately protect a building from condensation
- J4 Protection of building - the Product can be separated from hot appliances and surfaces to prevent a building catching fire
- L1(a)(i) Conservation of fuel and power - the Product can limit heat gains and losses through a wall
- Regulation 7(1)(a) Materials and workmanship - the Product is an adequate and proper material
- Regulation 23(1) Requirements relating to thermal elements - the Product can contribute to a wall complying with the requirements of L1(a)(i)
- Regulation 26 - CO₂ emission rates for new buildings - the Product can contribute to a building to not exceed its CO₂ emission rate
- Regulation 26A - Fabric energy efficiency rates - the Product can contribute to satisfying this Requirement

3.2.2 - WALES THE BUILDING REGULATIONS 2010 AND SUBSEQUENT AMENDMENTS

- C2(c) Resistance to moisture - a wall incorporating the Product can adequately protect a building from condensation
- J4 Protection of building - the Product can be separated from hot appliances and surfaces, to prevent a building catching fire
- L1(a)(i) Conservation of fuel and power - the Product can limit heat gains and losses through a wall
- Regulation 7(1)(a) Materials and workmanship - the Product is an adequate and proper material
- Regulation 23(1) Requirements relating to thermal elements - the Product can contribute to a wall complying with the requirements of L1(a)(i)
- Regulation 26 - CO₂ emission rates for new buildings - the Product can contribute to a building to not exceed its CO₂ 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 satisfying this Requirement

3.2.3 - SCOTLAND THE BUILDING (SCOTLAND) REGULATIONS 2004 AND SUBSEQUENT AMENDMENTS

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

- The Product is durable and fit for its intended purpose

3.2.3.2 Regulation 9 Building standards - construction

- 3.15 Condensation - a wall incorporating the Product can contribute to limiting surface or interstitial condensation
- 3.19 Combustion appliances - relationship to combustible materials - the Product can be separated from hot appliances and surfaces to prevent damage to a building
- 6.1(b) Carbon dioxide emissions - the Product will contribute to energy conservation of a building
- 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

3.2.4 - NORTHERN IRELAND THE BUILDING REGULATIONS (NORTHERN IRELAND) 2012 AND SUBSEQUENT AMENDMENTS

- 23(a)(b) Fitness of materials and workmanship - the Product is suitable and can be adequately mixed, prepared and applied
- 29 Condensation - the Product can contribute to limiting interstitial condensation in a building
- 39(a)(i) Conservation measures - the Product will limit heat gains and losses through a wall
- 40(2) Target carbon dioxide emission rate - the Product will contribute to a building to not exceed its target CO₂ emission rate
- 73(1)(b) Protection of people and buildings - the Product can be separated from hot appliances and surfaces to prevent damage to a building by heat or fire

3.3 - THIRD-PARTY ACCEPTANCE

None requested by the Agrément holder.

CHAPTER 4 - SOURCES

- 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 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 12865:2001 Hygrothermal performance of building components and building elements. Determination of the resistance of external wall systems to driving rain under pulsating air pressure
- 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 476-21:1987 Fire tests on building materials and structures. Methods for determination of the fire resistance of loadbearing elements of construction
- 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
- BS 8000-0:2014 Workmanship on construction sites. Introduction and general principles
- 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
- PAS 2030:2019 Specification for the installation of energy efficiency measures in existing buildings
- PAS 2035:2019 Retrofitting dwellings for improved energy efficiency - Specification and guidance
- Government Accredited Construction Details for Part L - England and Wales
- Accredited Construction Details for Scotland

Remark: apart from these sources, technical information and confidential reports have been assessed; any relevant documents are in the possession of Kiwa Ltd. and kept in the Technical Assessment File of this Agrément. The Installation Manual for the Product 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
-	First Issue	C Vurley	C Forshaw	March 2020

CHAPTER 6 - CONDITIONS OF USE

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For full terms and conditions refer to Kiwa Ltd.

SCOPE OF AGRÉMENT

This Agrément relates to ENERTITE® OS 200 (hereinafter the 'Product'), an in-situ formed, water blown, spray-applied thermal insulation layer which contributes to the airtightness of suspended floors. It can also contribute to the airtightness of suspended timber frame floors (without basement). The Product is for internal application directly to the underside of suspended timber decks of existing or new domestic buildings in the UK.

PRODUCT DESCRIPTION

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

PRODUCT ILLUSTRATION



THIRD-PARTY ACCEPTANCE

None requested by the Agrément holder.

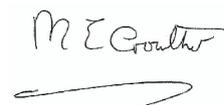
STATEMENT

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.

Chris Vurley, CEng
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;
- Production Control, Quality Management System and the Annual Verification procedure;
- Product components and ancillary items, 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, as appropriate;
- Sources.

MAJOR POINTS OF ASSESSMENT

Thermal performance - the Product improves the thermal insulation of suspended floors and has a declared aged thermal conductivity (λ_D) of 0.039 W/mK* (see section 2.2.9).

Moisture control - the Product (see section 2.1.10):

- has a low volume closed cell percentage;
- has a low water vapour transmission resistance;
- can contribute to limiting the risk of interstitial and surface condensation;
- is not resistant to water penetration.

Fire performance - the Product is classified as Euroclass F (combustible) in accordance with BS EN 13501-1 (see section 2.2.11).

Durability - the Product will have a service life equivalent to that of the suspended floor structure in which it is incorporated (see section 2.2.12).

CE Marking - the Agrément holder has responsibility for CE marking in accordance with all relevant harmonised European Product Standards (see section 2.2.13).

CONTENTS

Chapter 1 - General considerations

- 1.1 - Conditions of use
- 1.2 - Production Control and Quality Management System
- 1.3 - Annual verification procedure - continuous surveillance

Chapter 2 - Technical assessment

- 2.1 - Product components and ancillary items
- 2.2 - Points of attention to the Specifier
- 2.3 - Examples of details
- 2.4 - Installation
- 2.5 - Independently assessed Product characteristics

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
- 3.2 - The national Building Regulations
- 3.3 - Third-Party acceptance

Chapter 4 - Sources

Chapter 5 - Amendment history

Chapter 6 - Conditions of use

CHAPTER 1 - GENERAL CONSIDERATIONS

1.1 - CONDITIONS OF USE

1.1.1 Design considerations

See section 2.2.

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 relevant test reports, technical literature, the Agrément holder's quality plan, DoPs and site visit as appropriate.

1.1.4 Installation supervision

The quality of installation and workmanship must be controlled by a competent person who must be an employee of the installation company.

The Product must be installed strictly in accordance with the instructions 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.

1.2 - PRODUCTION CONTROL AND QUALITY MANAGEMENT SYSTEM

Kiwa Ltd. has determined that the Agrément holder fulfils all obligations in relation to this Agrément, in respect of the Product.

The initial audit demonstrated that the Agrément holder has a satisfactory Quality Management System (QMS) and is committed to continuously improving their quality plan. Document control and record keeping procedures were deemed satisfactory. A detailed Production Quality Specification (PQS) has been compiled to ensure traceability and compliance under the terms of this Agrément.

1.3 - ANNUAL VERIFICATION PROCEDURE - CONTINUOUS SURVEILLANCE

To demonstrate that the Product is in conformity with the requirements of the technical specification described in this Agrément, an Annual Verification procedure has been agreed with the Agrément holder in respect of continuous surveillance and assessment, and auditing of the Agrément holder's QMS.

This Agrément does not constitute a design guide for the Product. It is intended as an assessment of fitness for purpose only.

2.1 - ANCILLARY ITEMS

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

- spray machinery including plural component proportioners (double-acting positive displacement piston metering pumps) fitted with spray gun application equipment;
- breather membrane;
- Insupanel rafter system;
- vapour control layer (hereinafter 'VCL');
- floor boards;
- lining boards.

2.2 - POINTS OF ATTENTION TO THE SPECIFIER

2.2.1 Design responsibility

A Specifier may undertake a project specific design in which case it is recommended that the Specifier co-operates closely with the Agrément holder. The Specifier or installing contractor is responsible for the final as-built design.

2.2.2 Applied building physics (heat, air, moisture)

A competent specialist shall check the physical behaviour of a project specific design incorporating the Product and if necessary can offer advice in respect of improvements to achieve the final specification. The Specialist can be either a qualified employee of the Agrément holder or a suitably qualified consultant (in which case it is recommended that the consultant Specialist co-operates closely with the Agrément holder).

2.2.3 General design considerations

The Product can be used as insulation in the following applications:

- upgrade of floors with existing insulation under the floor to meet current U-value requirements;
- treatment of surfaces with restricted access or curved features;
- treatment of a plasterboard ceiling below a floor prior to installation of a floor finish;
- to remain exposed after treatment in non-habitable room spaces or covered by floor/lining boards in habitable rooms combined with adequate ventilation and a vapour check layer.

Where a room space is being converted into a heated habitable room, the Product can be applied directly under floor boards where a suitable VCL is used behind a plasterboard lining.

The Product shall not be applied to a VCL.

Care is needed for design detailing of joints at service/flue pipe openings and should be in accordance with BS 6093.

A suitable VCL incorporating lapped and sealed joints shall be applied behind a ceiling lining board or below any floor finish, unless an assessment to BS 5250 indicates that it is not necessary.

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

Ventilation below a ground floor should be provided by ventilators on at least two opposite external walls. Ducted air bricks or cross ventilation should be provided by a combination of openings and air ducts.

Suspended ground floors shall be designed and insulated to minimise thermal transmission through a floor. Extend cavity wall insulation below floor level and provide perimeter insulation to floors.

For habitable upper floor room spaces, the Product shall be covered by a plasterboard lining fixed to joists or battens and with all joints taped/sealed to give a minimum 30-minute fire rating.

The Product shall not be applied over junctions with external walls required to provide a minimum period of fire resistance. Care shall be taken to ensure continuity of fire resistance at junctions with fire-resisting elements, in accordance with the national Building Regulations.

Suspended floors shall 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 Product shall be separated by 8 cm from any heat emitting devices and any potential source of ignition, where temperature is $> 82^{\circ}\text{C}$.

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 that incorporate a protective fire hood.

The Product is an open 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.

New build design considerations

For new build construction, where a room space is warm, the Product should be applied to Type LR breather membrane.

New suspended floors should be designed and constructed in accordance with the national Building Regulations and the relevant timber, steel and concrete Eurocodes, BS Standards and Codes of Practice to prevent air infiltration.

Retrofit design considerations

Existing suspended floors shall be in a good state of repair with no signs of damp/rot. Any necessary repairs shall be carried out prior to installation.

2.2.4 Project specific design considerations

A pre-installation survey is required to allow determination of the project specific design - see section 2.4.3.

2.2.5 Permitted applications

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

2.2.6 Installer competence level

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

Installation shall be by approved installation companies who are members of the BASF FoamMasters Scheme.

2.2.7 Delivery, storage and site handling

The Product is delivered to site in suitable containers, that bear the Product name, the Agrément holder's name and the BDA Agrément® logo incorporating the number of this Agrément.

Store the Product in accordance with the Agrément holder's requirements. Particular care must be taken to:

- avoid exposure to direct sunlight for extended periods of time;
- avoid exposure to high or low temperatures for extended periods of time;
- store in a well-ventilated covered area to protect from rain, frost and humidity;
- store away from possible ignition sources.

The drums containing the Product should be stored indoors between 10 °C and 37 °C.

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. Ventilate and vacate the installed space for 24 hours subsequent to installation to prevent the inhalation of isocyanate vapour. When cured, the Product is non-hazardous.

2.2.8 Maintenance and repair

Once installed, the Product does not require regular maintenance provided a floor covering maintained. Damaged or poorly applied Product should be removed from the affected area using a hand saw. New Product should then be applied. For advice in respect of repair, consult the Agrément holder.

Performance factors in relation to the Major Points of Assessment

2.2.9 Thermal Performance

Thermal conductivity

Due to the nature of the open cell structure of the Product, it has a high air content and has adequate thermal resistance.

For the purpose of U-value calculations and to determine if the requirements of the national Building Regulations are met, the thermal resistance and U-value of suspended floors 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 (λ_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, increased insulation thickness may be required.

Account should be taken of the applicable Government Accredited Construction details for Part L, England and Wales, Accredited Construction Details, Scotland and energy measures in PAS 2030 and PAS 2035.

The requirement for limiting heat loss through a suspended floor, including the effect of thermal bridging, can be satisfied if the thermal transmittance (U-value) of the floor 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.

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

2.2.10 Moisture control

Cell structure

The Product has a very low volume closed cell percentage (3.2 %), in accordance with BS EN ISO 4590.

Water vapour transmission

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

Condensation risk

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

A Condensation Risk Analysis should be carried out by the Agrément holder in accordance with BS 5250, BS EN ISO 13788, BS EN ISO 13370 or BS EN 15026.

Water permeability

The open cell structure means the Product is not water-resistant.

The Product has low resistance to water absorption by immersion in accordance with BS EN 1609, Method A.

2.2.11 Fire performance

The Product is classified as Euroclass F (combustible), in accordance with BS EN 13501-1.

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

The Product must be suitably separated from any potential source of ignition.

The exposed Product has the potential to contribute to the development stages of a fire.

In habitable rooms where the Product is covered by plasterboard, the Product will not contribute to the development stages of a fire.

For suspended upper floors, adequate fire resistance and fire stopping shall be provided by floors between homes and at penetrations. Upper floors shall be constructed to ensure structural timber is located away from heat sources.

Proximity of flues and appliances

The installed Product shall be separated or shielded from any heat-emitting fixed combustion appliances, fireplaces, chimneys, or flue pipes passing through a floor and any potential source of ignition where temperature is in excess of 70 °C, by non-combustible insulation in accordance with the provisions of the national Building Regulations.

2.2.12 Durability

The Product will have a service life durability equivalent to that of the structure into which it is incorporated.

The Product is inert once cured and is therefore chemically inactive. The Product does not encourage corrosion on metals. Due to the good adhesion, moisture does not build up on metal substrates. No corrosive substances are released for the cured Product.

2.2.13 CE Marking

The harmonised European standard for the Product is BS EN 14315-1.

2.3 - EXAMPLES OF TYPICAL DETAILS

Diagram 1 - Detail of ceiling detail

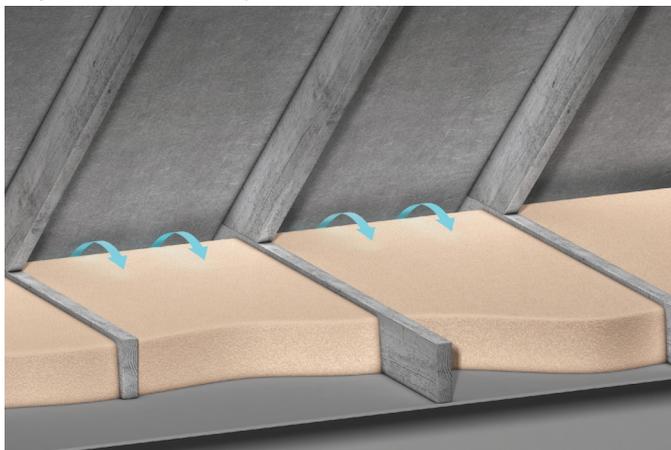


Diagram 2 - Detail of attic floor section

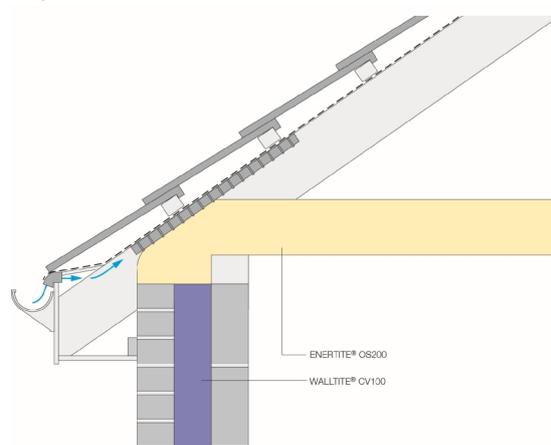
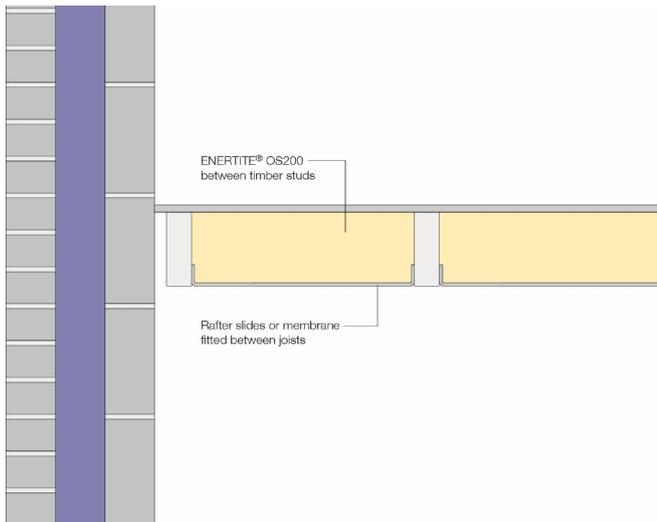


Diagram 3 - Suspended floor timber section



2.4 - INSTALLATION

The Product must be installed strictly in accordance with the instructions (hereinafter 'Installation Manual') of the Agrément holder and the requirements of this Agrément.

2.4.1 Installer competence level

See section 2.2.6.

2.4.2 Delivery, storage and site handling

See section 2.2.7.

2.4.3 Project specific installation considerations

The project specific design has been determined from a pre-installation survey.

The primary requirement of the pre-installation survey is to determine the following:

- the condition of a floor structure;
- there is no existing dampness, staining or condensation on the faces of a floor;
- the type, suitability and condition of floor timbers, concrete substrates and any openings;
- the type and condition of floor boards or breather membrane present;
- room space ventilation requirements;
- underfloor ventilation requirements;
- areas not to be sprayed.

2.4.4 Preparation

The following works shall be undertaken before the installation of the Product:

- any necessary repairs to floors, such as replacing damp or broken/rotten timbers or floor boards;
- any timber treatment carried out;
- clean, dry and free substrates from dirt, dust, grease, oils and loose particles;
- cover front faces of surfaces not to be sprayed, e.g. exposed joists;
- cover services, e.g. electrical cables, water tanks and pipes.

2.4.5 Outline installation procedure

The detailed installation sequence can be found in full in the Agrément holder's Installation Manual.

Installation of the Product shall be carried out in accordance with BS 8000-0 and BS EN 14315-2.

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

Do not apply the Product in thicknesses of greater than 152 mm per pass.

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 including nitrile gloves, disposable overalls and full-face mask (with A2P3 filters) air-fed from NIOSH approved pumping equipment.

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.

The moisture content of the surfaces of porous materials (including concrete) should not exceed 20 % before application commences. 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 low adhesion to the substrate.

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.

The spraying machine must be specially designed to mix and spray the Product via a spray gun. The Product is applied with volumetric displacement pumps with fixed mixing ratio A/B = 1/1 by volume. 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.

Components A and B must not be used when their temperature is below 10 °C. For the supply pumps to operate properly, the temperature of both components must be a minimum of 18 °C.

The spraying machine must have a temperature controller in the pre-heaters and hoses. The working temperature must be set between 49 °C and 54 °C, depending on the ambient temperature conditions. Higher temperatures up to 60 °C may be required in cold conditions.

During spraying, the ambient air temperature and substrate temperature must ideally be between 5 °C and 40 °C. An infrared or contact thermometer can be used for checking substrate surface temperature.

Due to the short reaction time, the spraying can be performed 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 2 m and protected by heat blankets.

Self-verification quality control checks provided for in BS EN 14315-2 must be carried out by the installer in respect of core density, appearance and thickness.

Initial setup

1. set the appropriate temperature and pressure parameters to guarantee the mixing quality of the Product and select a suitable spraying nozzle;
2. carry out quality control tests to check for round spray pattern, sticky patches, light or dark patches/streaks, no voids, consistent colour, appearance, reaction profile - cream time, gel time, tack-free time and free-rise density - using test methods in accordance with BS EN 14315-1, Annex E;
3. interlaminar adhesion shall be checked on a two-layer spray sample.

Suspended timber floor

The Product should be applied between timber joists of a suspended ground floor construction. This can be done from a crawl space between the underside of a floor and the ground surface below. The Product is sprayed to the underside of an existing floor with any excess material cut to suit specification.

Alternatively, the Product can be installed from above a floor where a floor covering has been removed. It is critical that a breathable membrane or Insupanel rafter system is installed between floor joists to receive the Product and ensure that the Product does not contact the ground surface below.

In both applications, the ventilation of a void between the timber joists structure and the ground surface below must be maintained in accordance with BS 5250.

2.4.6 Finishing

The following finishing is required upon completion of the installation:

- the Product should be cured and cold prior to undertaking any finishing work;
- in habitable rooms, the Product shall be boarded over, with all joints taped, sealed and supported by joists or battens;
- in non-habitable room spaces where the Products is left exposed, fire warning labels shall be placed in prominent positions;
- the floor is boarded over.

2.5 - INDEPENDENTLY ASSESSED PRODUCT CHARACTERISTICS

2.5.1 Thermal performance

Test	Test Standard	Result
Declared aged thermal conductivity (λ_D)	BS EN 12667	0.039 W/mK*

2.5.2 Moisture control

Test	Test Standard	Result	
Cell structure	Open and closed cell volume	BS EN ISO 4590	3.2 % closed cells (mean)
Water vapour transmission	Water vapour transmission rate	BS EN 12086, Method A	6023.9 mg/(m ² .h)
	Water vapour resistivity		16.7 MNs/gm
	Water vapour diffusion resistance factor (μ)		3.3
Water absorption	Short-term water absorption	BS EN 1609, Method A	1.143 Kg/m ² (Side A - mean)
			1.082 Kg/m ² (Side B - mean)

2.5.3 Fire Performance

Test	Standard	Result
Reaction to fire	BS EN 13501-1	F

The REACH Statement for the Product in respect of dangerous substances confirms no hazardous materials are present.

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 - THE 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 THE BUILDING REGULATIONS 2010 AND SUBSEQUENT AMENDMENTS

- C2(c) Resistance to moisture - a suspended floor incorporating the Product can adequately protect a building from condensation
- J4 Protection of building - the Product can be separated from hot appliances and surfaces, to prevent a building catching fire
- L1(a)(i) Conservation of fuel and power - the Product can limit heat gains and losses through a suspended floor
- Regulation 7(1)(a) Materials and workmanship - the Product is an adequate and proper material
- Regulation 23(1) Requirements relating to thermal elements - the Product can contribute to a suspended floor complying with the requirements of L1(a)(i)
- Regulation 26 - CO₂ emission rates for new buildings - the Product can contribute to a building to not exceed its CO₂ emission rate
- Regulation 26A - Fabric energy efficiency rates - the Product can contribute to satisfying this Requirement

3.2.2 - WALES THE BUILDING REGULATIONS 2010 AND SUBSEQUENT AMENDMENTS

- C2(c) Resistance to moisture - a suspended floor incorporating the Product can adequately protect a building from condensation
- J4 Protection of building - the Product can be separated from hot appliances and surfaces to prevent a building catching fire
- L1(a)(i) Conservation of fuel and power - the Product can limit heat gains and losses through a suspended floor
- Regulation 7(1)(a) Materials and workmanship - the Product is an adequate and proper material
- Regulation 23(1) Requirements relating to thermal elements - the Product can contribute to a suspended floor complying with the requirements of L1(a)(i)
- Regulation 26 - CO₂ emission rates for new buildings - the Product can contribute to a building to not exceed its CO₂ 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 satisfying this Requirement

3.2.3 - SCOTLAND THE BUILDING (SCOTLAND) REGULATIONS 2004 AND SUBSEQUENT AMENDMENTS

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

- The Product is durable and fit for its intended purpose

3.2.3.2 Regulation 9 Building standards - construction

- 3.15 Condensation - a suspended floor incorporating the Product can contribute to limiting surface or interstitial condensation
- 3.19 Combustion appliances - relationship to combustible materials - the Product can be separated from hot appliances and surfaces to prevent damage to a building
- 6.1(b) Carbon dioxide emissions - the Product will contribute to energy conservation of a building
- 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

3.2.4 - NORTHERN IRELAND THE BUILDING REGULATIONS (NORTHERN IRELAND) 2012 AND SUBSEQUENT AMENDMENTS

- 23(a)(b) Fitness of materials and workmanship - the Product is suitable and can be adequately mixed, prepared and applied
- 29 Condensation - the Product can contribute to limiting interstitial condensation in a building
- 39(a)(i) Conservation measures - the Product will limit heat gains and losses through a suspended floor
- 40(2) Target carbon dioxide emission rate - the Product will contribute to a building to not exceed its target CO₂ emission rate
- 73(1)(b) Protection of people and buildings - the Product can be separated from hot appliances and surfaces to prevent damage to a building by heat or fire

3.3 - THIRD-PARTY ACCEPTANCE

None requested by the Agrément holder.

CHAPTER 4 - SOURCES

- BS EN ISO 10211:2017 Thermal bridges in building construction. Heat flows and surface temperatures. Detailed calculations
- BS EN ISO 13370:2017 Thermal performance of buildings. Heat transfer via the ground. Calculation methods
- 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 12865:2001 Hygrothermal performance of building components and building elements. Determination of the resistance of external wall systems to driving rain under pulsating air pressure
- 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 15026:2007 Hygrothermal performance of building components and building elements. Assessment of moisture transfer by numerical simulation
- BS 476-21:1987 Fire tests on building materials and structures. Methods for determination of the fire resistance of loadbearing elements of construction
- 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
- BS 6576:2005+A1:2012 Code of practice for diagnosis of rising damp in walls of buildings and installation of chemical damp-proof courses
- BS 8000-0:2014 Workmanship on construction sites. Introduction and general principles
- 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
- PAS 2030:2019 Specification for the installation of energy efficiency measures in existing buildings
- PAS 2035:2019 Retrofitting dwellings for improved energy efficiency - Specification and guidance
- Government Accredited Construction Details for Part L - England and Wales
- Accredited Construction Details for Scotland

Remark: apart from these sources, technical information and confidential reports have been assessed; any relevant documents are in the possession of Kiwa Ltd. and kept in the Technical Assessment File of this Agrément. The Installation Manual for the Product 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
-	First Issue	C Vurley	C Forshaw	March 2020

CHAPTER 6 - CONDITIONS OF USE

This Agrément may only be reproduced and distributed in its entirety.

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BAR-19-101-P-A-UK
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ENERTITE® OS 200
Spray Foam Insulation
for Flat Roofs

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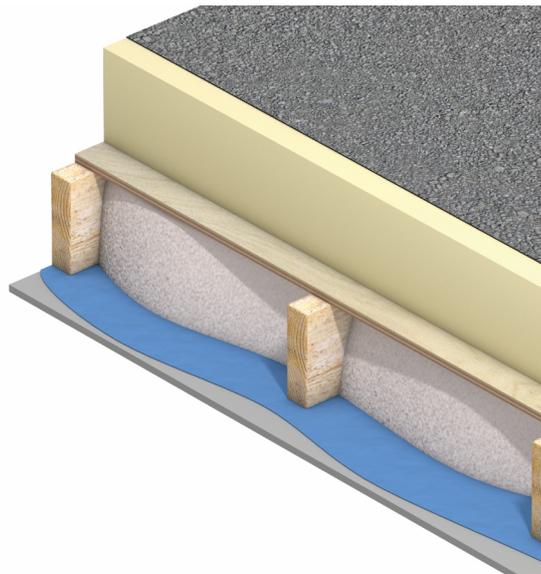
SCOPE OF AGRÉMENT

This Agrément relates to ENERTITE® OS 200 (hereinafter the 'Product'), an in-situ formed, water blown, spray-applied thermal insulation layer which contributes to the airtightness of flat roofs. It also contributes to the airtightness of flat timber framed roofs with a rafter slide. The Product is for internal application directly to the underside of flat roofs with Type LR breather membranes (new build) or roof deck boards in room spaces of existing or new domestic buildings in the UK.

PRODUCT DESCRIPTION

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

PRODUCT ILLUSTRATION



THIRD-PARTY ACCEPTANCE

None requested by the Agrément holder.

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.

Chris Vurley, CEng
Technical Manager, Building Products



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



SUMMARY OF AGREEMENT

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 Agreement covers the following:

- Conditions of use;
- Production Control, Quality Management System and the Annual Verification procedure;
- Product components and ancillary items, 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, as appropriate;
- Sources.

MAJOR POINTS OF ASSESSMENT

Thermal performance - the Product improves the thermal insulation of flat roofs and has a declared aged thermal conductivity of 0.039 W/mK* (see section 2.2.09).

Moisture control - the Product (see section 2.1.10):

- has a low volume closed cell percentage;
- has low water vapour transmission resistance;
- can contribute to limiting the risk of interstitial and surface condensation;
- is not resistant to water penetration.

Fire performance - the Product is classified as Euroclass F (combustible) in accordance with BS EN 13501-1 (see section 2.2.11).

Durability - the Product will have a service life equivalent to that of the flat roof structure in which it is incorporated (see section 2.2.12).

CE Marking - the Agreement holder has responsibility for CE marking in accordance with all relevant harmonised European Product Standards (see section 2.2.13).

CONTENTS

Chapter 1 - General considerations

- 1.1 - Conditions of use
- 1.2 - Production Control and Quality Management System
- 1.3 - Annual verification procedure - continuous surveillance

Chapter 2 - Technical assessment

- 2.1 - Product components and ancillary items
- 2.2 - Points of attention to the Specifier
- 2.3 - Examples of details
- 2.4 - Installation
- 2.5 - Independently assessed Product characteristics

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
- 3.2 - The national Building Regulations
- 3.3 - Third-Party acceptance

Chapter 4 - Sources

Chapter 5 - Amendment history

Chapter 6 - Conditions of use

CHAPTER 1 - GENERAL CONSIDERATIONS

1.1 - CONDITIONS OF USE

1.1.1 Design considerations

See section 2.2.

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 relevant test reports, technical literature, the Agrément holder's quality plan, DoPs and site visit as appropriate.

1.1.4 Installation supervision

The quality of installation and workmanship must be controlled by a competent person who must be an employee of the installation company.

The Product must be installed strictly in accordance with the instructions 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.

1.2 - PRODUCTION CONTROL AND QUALITY MANAGEMENT SYSTEM

Kiwa Ltd. has determined that the Agrément holder fulfils all obligations in relation to this Agrément, in respect of the Product.

The initial audit demonstrated that the Agrément holder has a satisfactory Quality Management System (QMS) and is committed to continuously improving their quality plan. Document control and record keeping procedures were deemed satisfactory. A detailed Production Quality Specification (PQS) has been compiled to ensure traceability and compliance under the terms of this Agrément.

1.3 - ANNUAL VERIFICATION PROCEDURE - CONTINUOUS SURVEILLANCE

To demonstrate that the Product is in conformity with the requirements of the technical specification described in this Agrément, an Annual Verification procedure has been agreed with the Agrément holder in respect of continuous surveillance and assessment, and auditing of the Agrément holder's QMS.

This Agrément does not constitute a design guide for the Product. It is intended as an assessment of fitness for purpose only.

2.1 - ANCILLARY ITEMS

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

- spray machinery including plural component proportioners (double-acting positive displacement piston metering pumps) fitted with spray gun application equipment;
- corrugated cardboard rafter slide (water vapour permeable), fitted between rafters to create a 50 mm ventilation gap between the underside of the flat roof decking and the Product;
- vapour control layer (hereinafter 'VCL');
- lining boards.

2.2 - POINTS OF ATTENTION TO THE SPECIFIER

2.2.1 Design responsibility

A Specifier may undertake a project specific design in which case it is recommended that the Specifier co-operates closely with the Agrément holder. The Specifier or installing contractor is responsible for the final as-built design.

2.2.2 Applied building physics (heat, air, moisture)

A competent specialist shall check the physical behaviour of a project specific design incorporating the Product and if necessary can offer advice in respect of improvements to achieve the final specification. The Specialist can be either a qualified employee of the Agrément holder or a suitably qualified consultant (in which case it is recommended that the consultant Specialist co-operates closely with the Agrément holder).

2.2.3 General design considerations

The Product can be used as insulation in the following applications:

- upgrade of flat roofs with existing insulation between rafters to meet current U-value requirements;
- treatment of surfaces with restricted access or curved features;
- remain exposed after treatment in non-habitable room spaces or covered by plasterboard lining in habitable rooms combined with adequate ventilation and a vapour check layer.

Where a room space is being converted into a heated habitable room, the Product can be applied directly to a timber deck or concrete deck where a suitable VCL is used behind a plasterboard lining.

A VCL is not required when the Product is installed between rafters in a non-habitable room space.

A cardboard rafter slide can be used to cover decking to create a ventilation gap, allowing any water vapour to disperse. The Product is then sprayed over the rafter slide.

Where the Product is applied to the underside of decking boards, the ventilation strategy must be in line with the guidance in BS 5250, taking into consideration the type of decking used.

Care is needed for design detailing of joints at rooflight and flue pipe openings and should be in accordance with BS 6093.

A suitable VCL incorporating lapped and sealed joints shall be applied behind a lining board, unless an assessment to BS 5250 indicates that it is not necessary.

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

For habitable room spaces, the Product shall be covered by a ceiling plasterboard lining fixed to rafters or battens and with all joints taped/sealed to give a minimum 30-minute fire rating.

The Product shall not be applied over junctions with external walls required to provide a minimum period of fire resistance. Care shall be taken to ensure continuity of fire resistance at junctions with fire-resisting elements, in accordance with the national Building Regulations.

Roofs shall 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 Product shall be separated by 8 cm from any heat emitting devices and any potential source of ignition, where temperature is $> 82^{\circ}\text{C}$.

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 that incorporate a protective fire hood.

The Product is an open 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.

New build design considerations

New flat roofs should be designed and constructed in accordance with the national Building Regulations and the relevant timber, steel and concrete Eurocodes, BS Standards and Codes of Practice to prevent moisture ingress and air infiltration.

Retrofit design considerations

Existing flat roofs shall be in a good state of repair with no signs of rain penetration or damp. Any necessary repairs shall be carried out prior to installation.

2.2.4 Project specific design considerations

A pre-installation survey is required for the installation of the Product - see section 2.4.3.

2.2.5 Permitted applications

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

2.2.6 Installer competence level

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

Installation shall be by approved installation companies who are members of the BASF FoamMasters Scheme.

2.2.7 Delivery, storage and site handling

The Product is delivered to site in suitable containers, that bear the Product name, the Agrément holder's name and the BDA Agrément® logo incorporating the number of this Agrément.

Store the Product in accordance with the Agrément holder's requirements. Particular care must be taken to:

- avoid exposure to direct sunlight for extended periods of time;
- avoid exposure to high or low temperatures for extended periods of time;
- store in a well-ventilated covered area to protect from rain, frost and humidity;
- store away from possible ignition sources.

The drums containing the Product should be stored indoors between 10 °C and 37 °C.

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. Ventilate and vacate the installed space for 24 hours subsequent to installation to prevent the inhalation of isocyanate vapour. When cured, the Product is non-hazardous.

2.2.8 Maintenance and repair

Once installed, the Product does not require regular maintenance, provided the weathertightness of a roof is maintained. Damaged or poorly applied Product should be removed from the affected area using a hand saw. New Product should then be applied. For advice in respect of repair, consult the Agrément holder.

Performance factors in relation to the Major Points of Assessment

2.2.9 Thermal performance

Thermal conductivity

Due to the nature of the open cell structure of the Product, it has a high air content and has adequate thermal resistance.

For the purpose of U-value calculations and to determine if the requirements of the 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 (λ_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 applied Product forms a solid and seamless air tight insulating foam layer without joints or gaps, reducing thermal bridges.

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

Account should be taken of the applicable Government Accredited Construction details for Part L, England and Wales, Accredited Construction Details, Scotland and energy measures in PAS 2030 and PAS 2035.

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 a flat 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 shall be taken in the overall design and construction at junctions with external walls and openings to minimise air infiltration and thermal bridging.

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 IP1/06, BRE Report 262 and BRE Report 497.

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

2.2.10 Moisture control

Cell structure

The Product has a very low volume closed cell percentage (3.2 %), in accordance with BS EN ISO 4590.

Water vapour transmission

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

Condensation risk

Flat roofs incorporating the Product can adequately limit the risk of interstitial and surface condensation when designed in accordance with BS 5250 and BRE Report 262. Room spaces should be ventilated in accordance with BS 5250. Care should be taken to provide adequate trickle ventilation, particularly in rooms expected to experience high humidity, and to ensure the integrity of VCLs (where installed) and plasterboard wall linings against vapour ingress.

A Condensation Risk Analysis should be carried out by the Agrément holder in accordance with BS 5250 and BS EN ISO 13788 or BS EN 15026.

Water permeability

The open cell structure means the Product is not water-resistant.

The Product has low resistance to water absorption by immersion in accordance with BS EN 1609, Method A.

2.2.11 Fire performance

The Product is classified as Euroclass F (combustible), in accordance with BS EN 13501-1.

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

The Product must be suitably separated from any potential source of ignition.

The exposed Product has the potential to contribute to the development stages of a fire.

In habitable rooms where the Product is covered by plasterboard, the Product will not contribute to the development stages of a fire.

The use of the Product in water-proofed flat roofs should not affect the external fire exposure classification when evaluated by assessment or test to BS 476-3.

Proximity of flues and appliances

The installed Product shall be separated or shielded from any heat-emitting fixed combustion appliances, fireplaces, chimneys, or flue pipes passing through a flat roof and any potential source of ignition where temperature is in excess of 70 °C, by non-combustible insulation in accordance with the provisions of the national Building Regulations.

2.2.12 Durability

The Product will have a service life durability equivalent to that of the structure into which it is incorporated.

The Product is inert once cured and is therefore chemically inactive. The Product does not encourage corrosion on metals. Due to the good adhesion, moisture does not build up on metal substrates. No corrosive substances are released for the cured Product.

2.2.13 CE Marking

The harmonised European standard for the Product is BS EN 14315-1.

2.3 - EXAMPLES OF TYPICAL DETAILS

Diagram 1 - Cold flat roof detail

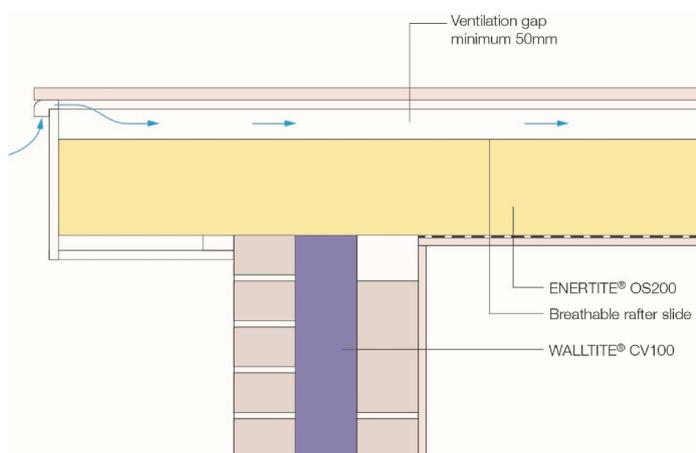
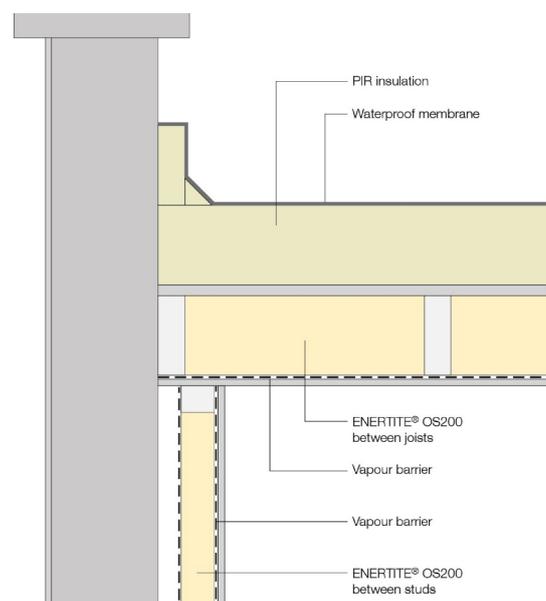


Diagram 2 - Warm flat roof detail



The Product must be installed strictly in accordance with the instructions (hereinafter 'Installation Manual') of the Agrément holder and the requirements of this Agrément.

2.4.1 Installer competence level

See section 2.2.6.

2.4.2 Delivery, storage and site handling

See section 2.2.7.

2.4.3 Project specific installation considerations

The project specific design has been determined from a pre-installation survey.

The primary requirement of the pre-installation survey is to determine the following:

- the external condition of a roof, gutters, chimney stacks, flashings etc;
- there is no existing rain ingress, dampness, staining or condensation on the internal face of a roof;
- the type, suitability and condition of roof timbers and any openings;
- the type and condition of any decking boards or breather membrane present;
- room space ventilation requirements;
- rafter void ventilation requirements;
- room space ventilation requirements;
- areas not to be sprayed.

2.4.4 Preparation

The following works shall be undertaken before the installation of the Product:

- any necessary repairs to roofs, such as replacing damp or broken/rotten timbers;
- repair any damaged or dislodged gutters, flashings;
- any timber treatment carried out;
- make roofs weathertight before application of the Product;
- clean, dry and free substrates from dirt, dust, grease, oils, solvents and loose particles/torching;
- cover front faces of surfaces not to be sprayed, e.g. exposed rafters;
- cover services, e.g. electrical cables.

2.4.5 Outline installation procedure

The detailed installation sequence can be found in full in the Agrément holder's Installation Manual.

Installation of the Product shall be carried out in accordance with BS 8000-0, BS EN 14315-1 and BS EN 14315-2.

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

Do not apply the Product in thicknesses of greater than 152 mm per pass.

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 including nitrile gloves, disposable overalls and full-face mask (with A2P3 filters) air-fed from NIOSH approved pumping equipment.

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.

The moisture content of the surfaces of porous materials (including concrete) should not exceed 20 % before application commences. 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 low adhesion to the substrate.

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.

The spraying machine must be specially designed to mix and spray the Product via a spray gun. The Product is applied with volumetric displacement pumps with fixed mixing ratio A/B = 1/1 by volume. 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.

Components A and B must not be used when their temperature is below 10 °C. For the supply pumps to operate properly, the temperature of both components must be a minimum of 18 °C.

The spraying machine must have a temperature controller in the pre-heaters and hoses. The working temperature must be set between 49 °C and 54 °C, depending on the ambient temperature conditions. Higher temperatures up to 60 °C may be required in cold conditions.

During spraying, the ambient air temperature and substrate temperature must ideally be between 5 °C and 40 °C. An infrared or contact thermometer can be used for checking substrate surface temperature.

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

Self-verification quality control checks provided for in BS EN 14315-2 must be carried out by the installer in respect of core density, appearance and thickness.

Initial set-up

1. set the appropriate temperature and pressure parameters to guarantee the mixing quality of the Product and select a suitable spraying nozzle;
2. carry out quality control tests to check for a round spray pattern, sticky patches, light or dark patches/streaks, no voids, consistent colour, appearance, reaction profile - cream time, gel time, tack-free time and free-rise density - using test methods in accordance with BS EN 14315-1;
3. interlaminar adhesion shall be checked on a two-layer spray sample.

Flat cold roof - insulation between and below rafters

The Product should be applied between roof joists to a breathable rafter slide put in place to provide a 50 mm ventilated separation layer between the underside of a flat roof decking and the insulating foam.

In accordance with BS 5250 eaves ventilation is required at a rate of 25,000 mm²/m of eaves run.

Flat warm roof

The Product should be applied between the roof joists directly to the underside of a warm deck.

2.4.6 Finishing

The following finishing is required upon completion of the installation:

- the Product should be cured and cold prior to undertaking any finishing work;
- when cured any excess foam can be shaved flush with the adjacent timber rafters to allow for fitting of a lining board with vapour barrier by others;
- in habitable pitched rooms, the Product must be covered by a suitable lining board, with all joints taped, sealed and supported by rafters, noggins or battens;
- in non-habitable room spaces where the Product is left exposed, fire warning labels must be placed in prominent positions.

2.5 - INDEPENDENTLY ASSESSED PRODUCT CHARACTERISTICS

2.5.1 Thermal performance

Test	Test Standard	Result
Declared aged thermal conductivity (λ_D)	BS EN 12667	0.039 W/mK*

2.5.2 Moisture control

Test	Test Standard	Result	
Cell structure	Open and closed cell volume	BS EN ISO 4590	3.2 % closed cells (mean)
Water vapour transmission	Water vapour transmission rate	BS EN 12086, Method A	6023.9 mg/(m ² .h)
	Water vapour resistivity		16.7 MNs/gm
	Water vapour diffusion resistance factor (μ)		3.3
Water absorption	Short-term water absorption	BS EN 1609, Method A	1.143 Kg/m ² (Side A - mean)
			1.082 Kg/m ² (Side B - mean)

2.5.3 Fire Performance

Test	Standard	Result
Reaction to fire	BS EN 13501-1	F

The REACH Statement for the Product in respect of dangerous substances confirms no hazardous materials are present.

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 - THE 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 THE BUILDING REGULATIONS 2010 AND SUBSEQUENT AMENDMENTS

- C2(c) Resistance to moisture - a roof incorporating the Product can adequately protect a building from condensation
- J4 Protection of building - the Product can be separated from hot appliances and surfaces to prevent a building catching fire
- L1(a)(i) Conservation of fuel and power - the Product can limit heat gains and losses through a roof
- Regulation 7(1)(a) Materials and workmanship - the Product is an adequate and proper material
- Regulation 23(1) Requirements relating to thermal elements - the Product can contribute to a roof complying with the requirements of L1(a)(i)
- Regulation 26 - CO₂ emission rates for new buildings - the Product can contribute to a building to not exceed its CO₂ emission rate
- Regulation 26A - Fabric energy efficiency rates - the Product can contribute to satisfying this Requirement

3.2.2 - WALES THE BUILDING REGULATIONS 2010 AND SUBSEQUENT AMENDMENTS

- C2(c) Resistance to moisture - a roof incorporating the Product can adequately protect a building from condensation
- J4 Protection of building - the Product can be separated from hot appliances and surfaces, to prevent a building catching fire
- L1(a)(i) Conservation of fuel and power - the Product can limit heat gains and losses through a roof
- Regulation 7(1)(a) Materials and workmanship - the Product is an adequate and proper material
- Regulation 23(1) Requirements relating to thermal elements - the Product can contribute to a roof complying with the requirements of L1(a)(i)
- Regulation 26 - CO₂ emission rates for new buildings - the Product can contribute to a building to not exceed its CO₂ 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 satisfying this Requirement

3.2.3 - SCOTLAND THE BUILDING (SCOTLAND) REGULATIONS 2004 AND SUBSEQUENT AMENDMENTS

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

- The Product is durable and fit for its intended purpose

3.2.3.2 Regulation 9 Building standards - construction

- 3.15 Condensation - a roof incorporating the Product can contribute to limiting surface or interstitial condensation
- 3.19 Combustion appliances - relationship to combustible materials - the Product can be separated from hot appliances and surfaces to prevent damage to a building
- 6.1(b) Carbon dioxide emissions - the Product will contribute to energy conservation of a building
- 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

3.2.4 - NORTHERN IRELAND THE BUILDING REGULATIONS (NORTHERN IRELAND) 2012 AND SUBSEQUENT AMENDMENTS

- 23(a)(b) Fitness of materials and workmanship - the Product is suitable and can be adequately mixed, prepared and applied
- 29 Condensation - the Product can contribute to limiting interstitial condensation in a building
- 39(a)(i) Conservation measures - the Product will limit heat gains and losses through a roof
- 40(2) Target carbon dioxide emission rate - the Product will contribute to a building to not exceed its target CO₂ emission rate
- 73(1)(b) Protection of people and buildings - the Product can be separated from hot appliances and surfaces to prevent damage to a building by heat or fire

3.3 - THIRD-PARTY ACCEPTANCE

None requested by the Agrément holder.

CHAPTER 4 - SOURCES

- BS EN ISO 10211:2017 Thermal bridges in building construction. Heat flows and surface temperatures. Detailed calculations
- 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 1928:2000 Flexible sheets for waterproofing. Bitumen, plastic and rubber sheets for roof waterproofing. Determination of watertightness
- 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
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- 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
- PAS 2030:2019 Specification for the installation of energy efficiency measures in existing buildings
- PAS 2035:2019 Retrofitting dwellings for improved energy efficiency - Specification and guidance
- Government Accredited Construction Details for Part L - England and Wales
- Accredited Construction Details for Scotland

Remark: apart from these sources, technical information and confidential reports have been assessed; any relevant documents are in the possession of Kiwa Ltd. and kept in the Technical Assessment File of this Agrément. The Installation Manual for the Product 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
-	First Issue	C Vurley	C Forshaw	March 2020

CHAPTER 6 - CONDITIONS OF USE

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