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Agrément Certificate
13/5080
Product Sheet 1

K REND EXTERNAL WALL INSULATION SYSTEMS

K REND EXTERNAL WALL INSULATION SYSTEM 1

This Agrément Certificate Product Sheet⁽¹⁾ relates to the K Rend External Wall Insulation System 1, comprising mechanically-fixed enhanced expanded polystyrene (EPS) boards with a mesh-reinforced basecoat render. The system is for application to the outside of external walls of masonry or dense concrete construction in new or existing domestic and non-domestic buildings up to 18 m in height.

(1) Hereinafter referred to as 'Certificate'.

CERTIFICATION INCLUDES:

- factors relating to compliance with Building Regulations where applicable
- factors relating to additional non-regulatory information where applicable
- independently verified technical specification
- assessment criteria and technical investigations
- design considerations
- installation guidance
- regular surveillance of production
- formal three-yearly review.

KEY FACTORS ASSESSED

Thermal performance — the system can be used to improve the thermal performance of external walls and contribute to meet the requirements of the Building Regulations (see section 6).

Strength and stability — a correctly designed system will have adequate resistance to wind loads and impact damage (see section 7).

Behaviour in relation to fire — the enhanced expanded polystyrene is combustible but the render finish has a classification of B2-s1, d0 external surface rating (see section 8).

Durability — when installed and maintained in accordance with the Certificate holder's recommendations and the terms of this Certificate, the system will have a life of at least 30 years (see section 13).



The BBA has awarded this Certificate to the company named above for the system described herein. This system has been assessed by the BBA as being fit for its intended use provided it is installed, used and maintained as set out in this Certificate.

On behalf of the British Board of Agrément

Date of First issue: 10 January 2014

John Albon — Head of Approvals
Energy and Ventilation

Claire Curtis-Thomas
Chief Executive

The BBA is a UKAS accredited certification body — Number 113. The schedule of the current scope of accreditation for product certification is available in pdf format via the UKAS link on the BBA website at www.bbacerts.co.uk

Readers are advised to check the validity and latest issue number of this Agrément Certificate by either referring to the BBA website or contacting the BBA direct.

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Regulations

In the opinion of the BBA, the K Rend External Wall Insulation System 1, if installed, used and maintained in accordance with this Certificate, will meet or contribute to meeting the relevant requirements of the following Building Regulations (the presence of a UK map indicates that the subject is related to the Building Regulations in the region or regions of the UK depicted):



The Building Regulations 2010 (England and Wales) (as amended)

| | | |
|---------------------|-----------------|---|
| Requirement: | A1 | Loading |
| Comment: | | The system can sustain and transmit wind loads to the substrate wall. See section 7.4 of this Certificate. |
| Requirement: | B4(1) | External fire spread |
| Comment: | | The system is classified B2-s1, d0 and, therefore, meets this Requirement. See sections 8.1 to 8.5 of this Certificate. |
| Requirement: | C2(b) | Resistance to moisture |
| Comment: | | The system provides a degree of protection against rain ingress. See sections 4.5 and 10.1 of this Certificate. |
| Requirement: | C2(c) | Resistance to moisture |
| Comment: | | The system contributes to minimising the risk of interstitial and surface condensation. See sections 11.1, 11.2 and 11.4 of this Certificate. |
| Requirement: | L1(a)(i) | Conservation of fuel and power |
| Comment: | | The system will contribute to meeting the U value requirement. See sections 6.1 to 6.3 of this Certificate. |
| Regulation | 7 | Materials and workmanship |
| Comment: | | The system is acceptable. See sections 13.1 and the <i>Installation</i> part of this Certificate. |
| Regulation: | 26 | CO₂ emission rates for new buildings |
| Comment: | | The system will contribute to a building meeting its target emission rate. See sections 6.1 to 6.3 of this Certificate. |



The Building (Scotland) Regulations 2004 (as amended)

| | | |
|--------------------|------------------|---|
| Regulation: | 8(1)(2) | Fitness and durability of materials and workmanship |
| Comment: | | The use of the system satisfies the requirements of this Regulation. See sections 12.1 and 13.1 and the <i>Installation</i> part of this Certificate. |
| Regulation: | 9 | Building standards applicable to construction |
| Standard: | 1.1 | Structure |
| Comment: | | The system can sustain and transmit wind loads to the substrate wall, with reference to clauses 1.1.1 ⁽¹⁾⁽²⁾ and 1.1.2 ⁽¹⁾⁽²⁾ . See section 7.4 of this Certificate. |
| Standard: | 2.6 | Spread to neighbouring buildings |
| Comment: | | The system has a surface spread-of-flame classification of B2-s1, d0 and, therefore, can meet this Standard, with reference to clauses 2.6.4 ⁽¹⁾⁽²⁾ , 2.6.5 ⁽¹⁾ and 2.6.6 ⁽²⁾ . See sections 8.1 to 8.5 of this Certificate. |
| Standard: | 2.7 | Spread on external walls |
| Comment: | | The system incorporates materials which would not be classified as 'non combustible' as defined in this Standard, with reference to clause 2.7.1 ⁽¹⁾⁽²⁾ , 2.7.2 ⁽²⁾ and Annex 2A ⁽¹⁾ . See sections 8.1 to 8.5 of this Certificate. |
| Standard: | 3.10 | Precipitation |
| Comment: | | Walls insulated with the system will contribute to a construction satisfying this Standard, with reference to clauses 3.10.1 ⁽¹⁾⁽²⁾ and 3.10.6 ⁽¹⁾⁽²⁾ . See sections 4.5 and 10.3 of this Certificate. |
| Standard: | 3.15 | Condensation |
| Comment: | | Walls insulated with the system will satisfy the requirements of this Standard, with reference to clauses 3.15.1 ⁽¹⁾⁽²⁾ , 3.15.4 ⁽¹⁾⁽²⁾ and 3.15.5 ⁽¹⁾⁽²⁾ . See sections 11.3 and 11.4 of this Certificate. |
| Standard: | 6.1(b) | Carbon dioxide emissions |
| Standard: | 6.2 | Buildings insulation envelope |
| Comment: | | Walls insulated with the system can contribute to satisfying these Standards, with reference to clauses 6.1.1 ⁽¹⁾⁽²⁾ , 6.1.2 ⁽¹⁾⁽²⁾ , 6.1.3 ⁽¹⁾⁽²⁾ , 6.1.4 ⁽²⁾ , 6.1.6 ⁽¹⁾ , 6.1.8 ⁽²⁾ , 6.1.10 ⁽²⁾ , 6.2.1 ⁽¹⁾⁽²⁾ , 6.2.2 ⁽¹⁾⁽²⁾ , 6.2.3 ⁽¹⁾⁽²⁾ , 6.2.4 ⁽¹⁾⁽²⁾ , 6.2.5 ⁽¹⁾⁽²⁾ , 6.2.6 ⁽¹⁾⁽²⁾ , 6.2.7 ⁽²⁾ , 6.2.11 ⁽¹⁾ and 6.2.13 ⁽²⁾ of these Standards. See section 6 of this Certificate. |
| Standard: | 7.1(a)(b) | Statement of sustainability |
| Comment: | | The product can contribute to meeting 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, with reference to clauses 7.1.4 ⁽¹⁾⁽²⁾ [Aspects 1 ⁽¹⁾⁽²⁾ and 2 ⁽¹⁾], 7.1.6 ⁽¹⁾⁽²⁾ [Aspects 1 ⁽¹⁾⁽²⁾ and 2 ⁽¹⁾] and 7.1.7 ⁽¹⁾⁽²⁾ [Aspect 1 ⁽¹⁾⁽²⁾]. See section 6 of this Certificate. |
| Regulation: | 12 | Building standards applicable to conversions |
| Comment: | | All comments given for these systems under Regulation 9, Standards 1 to 6, also apply to this Regulation, with reference to clause 0.12.1 ⁽¹⁾⁽²⁾ and Schedule 6 ⁽¹⁾⁽²⁾ . (1) Technical Handbook (Domestic). (2) Technical Handbook (Non-Domestic). |



The Building Regulations (Northern Ireland) 2012

| | | |
|-------------|----------|---|
| Regulation: | 23 | Fitness of materials and workmanship |
| Comment: | | The system is acceptable. See section 13.1 and the <i>Installation</i> part of this Certificate. |
| Regulation: | 28 | Resistance to moisture and weather |
| Comment: | | Walls insulated with the system will satisfy this Regulation. See sections 4.5 and 10.1 of this Certificate. |
| Regulation: | 29 | Condensation |
| Comment: | | Walls insulated with the systems will satisfy the requirements of this Regulation. See sections 4.8, 11.2, 11.4 and 11.5 of this Certificate. |
| Regulation: | 30 | Stability |
| Comment: | | The system can sustain and transmit wind loads to the substrate wall. See sections 7.4 of this Certificate. |
| Regulation: | 36(a) | External fire spread |
| Comment: | | The system has a Class B2-s1, d0 surface and can satisfy this Regulation. See sections 8.1 to 8.5 of this Certificate. |
| Regulation: | 39(a)(i) | Conservation measures |
| Comment: | | The system can contribute to enabling, a wall to meet this Regulation. See section 6 of this Certificate. |
| Regulation: | 40 | Target carbon dioxide emission rate |
| Comment: | | The system will contribute to a building satisfying its target emission rate. See section 6 of this Certificate. |

Construction (Design and Management) Regulations 2007

Construction (Design and Management) Regulations (Northern Ireland) 2007

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

See section: 3 *Delivery and site handling* (3.2) of this Certificate.

Additional Information

NHBC Standards 2014

NHBC accepts the use of the K Rend External Wall Insulation System 1, provided it is installed, used and maintained in accordance with this Certificate, in relation to *NHBC Standards*, Part 6 Superstructure and Chapter 6.9 *Curtain walling and cladding*.

Technical Specification

1 Description

1.1 The K Rend External Wall Insulation System 1 comprises enhanced expanded polystyrene (EPS) insulation boards mechanically fixed directly to the substrate wall with a mesh-reinforced high polymer content basecoat and a 1.5 mm or 3.0 mm acrylic render finish.

1.2 The system (see Figure 1) comprises:

Insulation

- Enhanced Polystyrene EPS 70E (enhanced expanded polystyrene) insulation board — 1200 mm by 600 mm in a range of thicknesses between 40 mm and 200 mm in 10 mm increments, with a nominal density of 17 kg·m⁻³ and a minimum compressive strength of 70 kN·m⁻². Boards are manufactured to comply with the requirements of EPS 70, Class E (flame retardant) material to BS EN 13163 : 2008.

Mechanical fixings

- mechanical fixings — proprietary external wall insulation fixings of adequate length to suit the substrate and insulation thickness, with a minimum 60 mm washer diameter and minimum plate stiffness of 0.6 kN·mm⁻¹, approved and supplied by the Certificate holder⁽¹⁾, examples include:
 - Ejotherm NT U, polyethylene with metal centre pin
 - Ejotherm STR U, polyethylene with metal centre screw.

(1) The Ejot SBL 140, a proprietary 140 mm diameter polyamide extension washer, can be used in conjunction with the above anchors to enhance the pull-through capacity.

Basecoat

- K Rend HP14 Base — a cement-based, high polymer modified basecoat. It is supplied as a powder, to which only potable water is added in the correct proportion, and applied to a thickness of 6 mm or greater.

Reinforcement

- reinforcing mesh — an alkali-resistant glassfibre mesh in 50 m by 1 m rolls, with a grid pattern of 4 mm by 4 mm, and nominal weight of 160 g·m⁻².

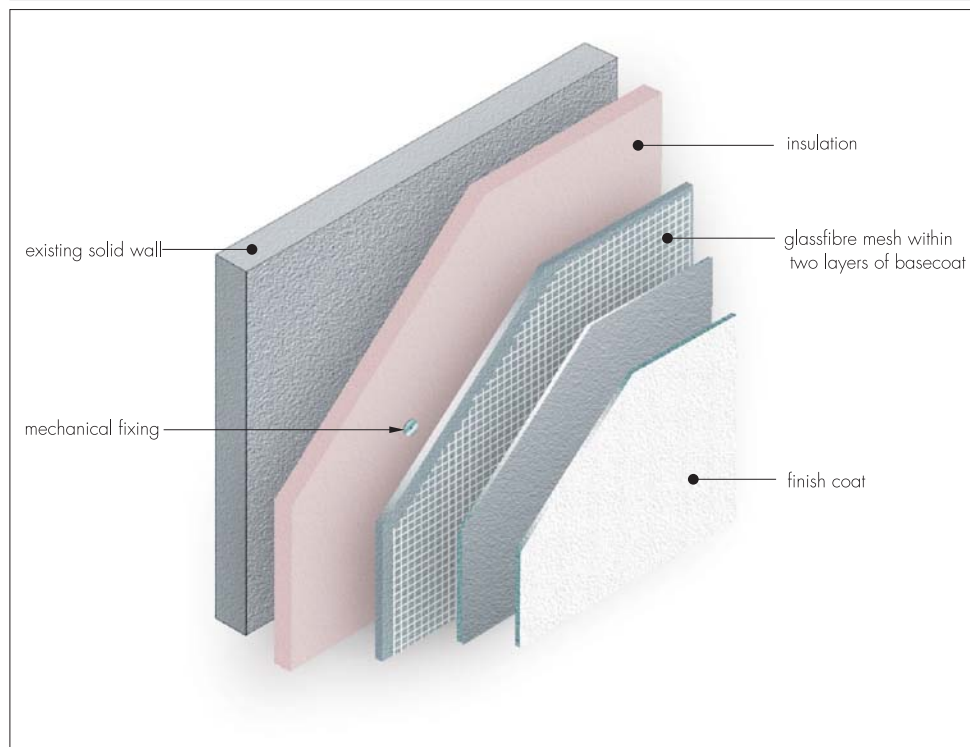
Primer

- K Rend Primer TC — available in a range of colours to suit the colour of finish selected.

Finishing coat

- K Rend Acrylic TC — a decorative topcoat in 15 and 30 grades and in a range of colours.

Figure 1 K Rend External Wall Insulation System 1



1.3 Ancillary materials, outside the scope of this Certificate, include:

- profiles — a range of standard profiles for such details as wall bases, end stops, corner meshes and expansion joints, produced in either stainless steel number 1.4301 to BS EN 10088-1 : 2005 or galvanized steel strip DX51D + Z275 N+A-U to BS EN 10327 : 2004, with a polyester powder paint finish to BS EN 13438 : 2005. Aluminium or rigid PVC profiles are also available. Profiles are provided to the specifier's requirements and approved by the Certificate holder
- profile fixings — glass-reinforced plastic (GRP), plated or stainless-steel screws or driven pins with plastic expansion sleeves
- sealant — silicone as approved by the Certificate holder.

1.4 The boards are attached to the substrate with a minimum of four or five mechanical fixings per board (see section 16.5 and Figure 5).

1.5 The K Rend HP14 Base render is applied in two layers, with the mesh in between, to give a finished coat of at least 6 mm thick (see Figure 1).

2 Manufacture

As part of the assessment and ongoing surveillance of the quality of the system components, the BBA has:

- agreed with the manufacturer the quality control procedures and product testing to be undertaken
- assessed and agreed the quality control operated over batches of incoming materials
- monitored the production process and verified that it is in accordance with the documented process
- evaluated the process for management of nonconformities
- checked that equipment has been properly tested and calibrated
- undertaken to carry out the above measures on a regular basis through a surveillance process, to verify that the specifications and quality control operated by the manufacturer are being maintained.

3 Delivery and site handling

3.1 The insulation is delivered to site shrink-wrapped in polythene packs bearing the manufacturer's and product identification marks and batch numbers.

3.2 Components are delivered in the quantities and packages listed in Table 1. Each package carries the manufacturer's and product identification and batch number. The basecoat and render also include the BBA logo incorporating the number of this Certificate.

Table 1 Component supply details

| Component | Quantity and packaging |
|------------------------------|---|
| Enhanced Polystyrene EPS 70E | shrunk-wrapped in individual packs — number of boards varies depending on thickness |
| Fixings | boxed by the manufacturer |
| K Rend HP14 Base | 25 kg bag |
| Glassfibre mesh | 1 m x 50 m roll |
| K Rend Primer TC | 15 kg tub |
| K Rend Acrylic TC | 25 kg tub |

3.3 The insulation boards should be stored on a firm, clean, level base, off the ground and must be protected from prolonged exposure to sunlight either by storing opened packs under cover in dry conditions or re-covering with opaque polythene sheeting.

3.4 Care must be taken when handling the insulation boards to avoid both damage and contact with solvents or bitumen products. The boards must not be exposed to open flame or other ignition sources. Boards that become damaged, soiled or wet should be discarded.

3.5 The powder components should be stored in dry conditions, off the ground, and protected from frost at all times. Tubs of unopened render will have a shelf-life of 12 months when stored correctly.

Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on the K Rend External Wall Insulation System 1.

Design Considerations

4 General

4.1 The K Rend External Wall Insulation System 1, when installed in accordance with this Certificate, is satisfactory for use as external wall insulation and is effective in reducing the thermal transmittance (U value) of the walls of new and existing buildings of up to 18 m in height. It is essential that the detailing techniques specified in this Certificate are carried out to a high standard if the ingress of water into the insulation is to be avoided and the full thermal benefit obtained from the system. Only details approved by the Certificate holder must be used.

4.2 The system is applied to the outside of external walls of masonry and dense or no-fines concrete construction and is suitable for use on new or existing domestic or non-domestic buildings. Application and maintenance must be carried out strictly in accordance with this Certificate and the Certificate holder's instructions, by installers trained and approved by the Certificate holder.

4.3 The system can improve the weather resistance of a wall and provide a decorative finish. However, it may be installed only where the substrate is inherently waterproof in its own right and where other potential sources of moisture penetration have been dealt with separately and where there are no signs of dampness on the inner surface of the wall, other than those caused solely by condensation. The system can be used to overcome internal condensation.

4.4 Existing buildings subject to national Building Regulations should have wall surfaces in accordance with section 14 *Site survey and preliminary work* of this Certificate.

4.5 New buildings subject to national Building Regulations should be constructed in accordance with the relevant recommendations of:

- BS EN 1996-2 : 2006 and its UK National Annex — the designer should select a construction appropriate to the local wind-driven rain index, paying due regard to the design detailing, workmanship and materials to be used
- BS 8000-3 : 2001.

4.6 Other new buildings, not subject to any of the previous requirements, should also be built in accordance with the Standards listed in section 4.5.

4.7 The effect of the installation of the system on the acoustic performance of a construction is outside the scope of this Certificate.

4.8 The fixing of rainwater goods, satellite dishes, clothes lines, hanging baskets and similar items is outside the scope of this Certificate.

4.9 It is essential that the system is installed and maintained in accordance with the conditions set out in this Certificate.

5 Practicability of installation

The system should be installed only by specialised contractors who have successfully undergone training and registration by the Certificate holder.

Note: The BBA operates a UKAS Accredited Approved Installer Scheme for external wall insulation; details of installer companies approved are included on the BBA's website (www.bbacerts.co.uk).

6 Thermal performance

6.1 Calculations of the thermal transmittance (U value) should be carried out in accordance with BS EN ISO 6946 : 2007 and BRE Report (BR 443 : 2006) *Conventions for U-value calculations*, using the declared thermal conductivity (λ_D value) of $0.032 \text{ W}\cdot\text{m}^{-1}\cdot\text{K}^{-1}$.

6.2 The U value of a completed wall will depend on the thickness of the insulation used, the number and type of fixings, the insulating value of the substrate masonry and its internal finish. Example U values of walls incorporating the system are given in Table 2 and are based on five fixings per board (6.9 per m^2).

Table 2 Insulation thickness required to achieve some typical design values⁽¹⁾

| U value ($\text{W}\cdot\text{m}^{-2}\cdot\text{K}^{-1}$) | Insulation thickness requirement (mm) | |
|---|---|---|
| | Brickwork ($\lambda = 0.56 \text{ W}\cdot\text{m}^{-1}\cdot\text{K}^{-1}$) | Dense blockwork ($\lambda = 1.75 \text{ W}\cdot\text{m}^{-1}\cdot\text{K}^{-1}$) |
| 0.19 | 160 | 170 |
| 0.26 | 110 | 120 |
| 0.28 | 100 | 110 |
| 0.30 | 100 | 100 |
| 0.35 | 80 | 85 |

(1) The following values for other elements of the construction were used:

- external boundary resistance (R_{se}) – $0.04 \text{ m}^2\cdot\text{K}\cdot\text{W}^{-1}$
- render (14 mm sand and cement) – $\lambda = 1.0 \text{ W}\cdot\text{m}^{-1}\cdot\text{K}^{-1}$, $\mu = 6$ (wet)
- EPS 70E (215 mm) – 93.3%
- brickwork (protected) – $\lambda = 0.56 \text{ W}\cdot\text{m}^{-1}\cdot\text{K}^{-1}$ ($\mu = 10$) [or 200 mm blockwork, $\lambda = 1.75 \text{ W}\cdot\text{m}^{-1}\cdot\text{K}^{-1}$ ($\mu = 100$ and 6.7%)]
- mortar – $\lambda = 0.88 \text{ W}\cdot\text{m}^{-1}\cdot\text{K}^{-1}$
- plaster (13 mm) – $\lambda = 0.57 \text{ W}\cdot\text{m}^{-1}\cdot\text{K}^{-1}$, $\mu = 10$
- internal boundary resistance (R_{si}) – $0.13 \text{ m}^2\cdot\text{K}\cdot\text{W}^{-1}$.

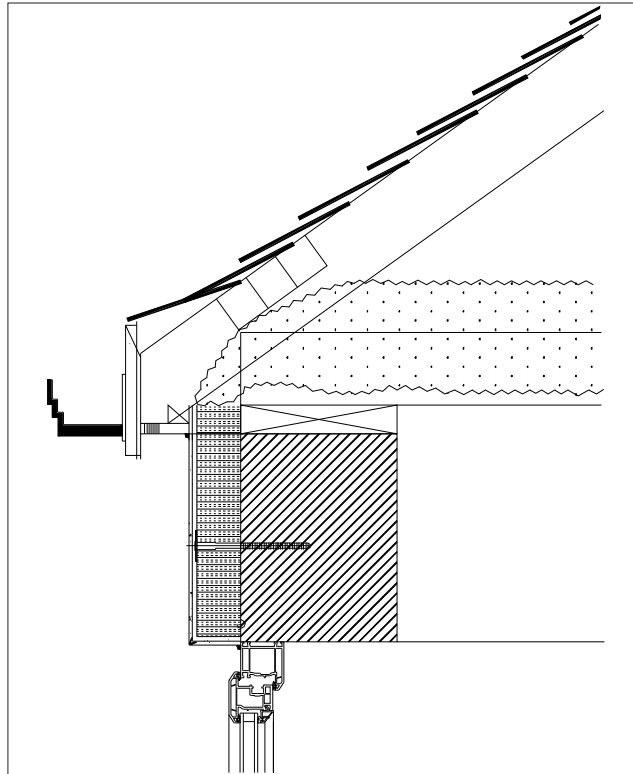
6.3 The system can maintain, or contribute to maintaining, continuity of thermal insulation (see Figure 2). Care must be taken to ensure an appropriate thickness of insulation is used, particularly at points such as junctions between floors and walls and at window and door reveals, to avoid thermal bridging and reduce the risk of condensation forming at these points. Items such as windows and doors should be selected taking into account the thickness of insulation required at the reveals to help prevent condensation forming at these junctions. Detailed guidance for junctions and on limiting heat loss by air infiltration can be found in:

England and Wales – Approved Documents to Part L and, for new thermal elements to existing buildings, Accredited Construction Details (version 1.0). For new-build, see also SAP 2009, Appendix K, and the *iSBEM User Manual*

Scotland – *Accredited Construction Details (Scotland)*

Northern Ireland – Accredited Construction Details (version 1.0).

Figure 2 Junction details



7 Strength and stability

7.1 The system can adequately transfer to the wall the self weight and negative and positive (suction and pressure) loads normally experienced in the United Kingdom.

7.2 Positive wind load (pressure) is transferred to the substrate wall directly via bearing and compression of the render, and insulation.

7.3 Negative wind pressure (suction) is resisted by the bond between each component. The insulation boards are retained by the external wall insulation system anchors.

7.4 The wind loads on the wall should be calculated in accordance with BS EN 1991-1-4 : 2005 and its UK National Annex. Special consideration should be given to locations with high wind-load pressure coefficients as additional fixings may be necessary. In accordance with BS EN 1990 : 2002 and its UK National Annex, it is recommended that a load factor of 1.5 is used to determine the ultimate wind load to be resisted by the system.

7.5 Assessment of structural performance for individual buildings must be carried out by a suitably qualified and experienced person to confirm that:

- the substrate wall has adequate strength to resist additional loads that may be applied as a result of installing the system, ignoring any contribution from the insulation system
- the proposed system and associated fixing layout provides adequate resistance to negative wind loads (based on the results of the site investigation and test results given in Table 3) (see also section 7.8).
- an appropriate number of site-specific pull-out tests must be conducted on the substrate of the building to determine the minimum resistance to failure of the fixings. The characteristic pull-out resistance should be determined in accordance with the guidance given in ETAG 014 : 2002, Annex D (ie by calculating the mean of the lowest five values and multiplying by 0.6).

7.6 The number and centres of fixings should be determined by the system designer. Provided the substrate wall is suitable and an appropriate fixing is selected, the mechanical fixings will adequately support and transfer the weight of the render insulation system to the substrate wall at the minimum spacing given in this Certificate.

7.7 Typical characteristic pull-out strengths for the fixings taken from the corresponding European Technical Approval (ETA) are given in Table 3; however, these values are dependent on the substrate and the fixing must be selected to suit the loads and substrate concerned.

Table 3 Fixings — typical characteristic pull-out strengths

| Fixing type | Typical pull-out strength ⁽¹⁾ (N) |
|---|--|
| Polyethylene with metal centre pin (Ejotherm NT U) | 1200 |
| Polyethylene with metal centre screw (Ejotherm STR U) | 1500 |

(1) Values are determined in accordance with ETAG 014 : 2002 and are dependent on the substrate.

7.8 The resistance forces data are given in Table 4 and are the results of calculations based upon:

- fixings arranged in the pattern described and shown in section 16.5 and Figure 5
- characteristic pull-through resistances determined by the BBA from tests on anchors with 60 mm diameter plates.

Table 4 Example calculation sheet to establish ultimate wind load capacity

| Factor (unit) | Insulation value ⁽¹⁾ | |
|---|---------------------------------|-------------|
| Plate diameter of anchor (mm) | 60 | 140 |
| Thickness (mm) | 60 | 60 |
| Insulation tensile resistance (kPa) | 196 | 196 |
| Fixings types | See Table 3 | See Table 3 |
| Characteristic pull-through resistance ⁽²⁾ (per anchor) (N) | 475 | 1090 |
| Factor of safety | 2.5 | 2.5 |
| Design pull-through resistance ⁽³⁾ (N) | 190.5 | 436 |
| Characteristic anchor pull-out resistance ⁽⁴⁾ (per anchor) (N) | 1200 | 1200 |
| Factor of safety | 2 | 2 |
| Design pull-out resistance ⁽⁵⁾ (per anchor) (N) | 600 | 600 |
| Limiting design value ⁽⁶⁾ (per fixing) (N) | 190.5 | 436 |
| Limiting design value per slab ⁽⁷⁾ (with five fixings) (N) | 950 | 2180 |
| Area of slab (m ²) | 0.72 | 0.72 |
| Limiting pressure (kN·m ⁻²) | 1.33 | 3.02 |

(1) Calculation based on a 1200 mm by 600 mm (total area 0.72 m²) insulation slab attached by five fixings.

(2) Characteristic pull-through resistance of insulation over the head of the fixing, in accordance with BS EN 1990 : 2002, Annex D7.2.

(3) The safety factor of 2.5 is applied and based on the assumption that all insulation slabs are quality control tested to establish tensile strength perpendicular to the face of the slab.

(4) See section 7.5, third bullet point.

(5) In accordance with this guideline, a safety factor of two is applied to this figure to establish the design value to resist ultimate loads.

(6) The lesser of the slab design pull-through resistance and the anchor design pull-out resistance.

(7) Slab design pull-over resistance multiplied by the number of fixings, based upon the limiting resistance.

Impact resistance

7.9 Hard body impact tests were carried out in accordance with ETAG 004 : 2011. The system is suitable for use in use category III⁽¹⁾.

(1) The use categories are defined in ETAG 004 as:

- Use category I — a zone readily accessible at ground level to the public and vulnerable to hard body impacts but not subjected to abnormally rough use
- Use category II — a zone liable to impacts from thrown or kicked objects, but in public locations where the height of the system will limit the size of the impact; or at lower levels where access to the building is primarily to those with some incentive to exercise care
- Use category III — a zone not likely to be damaged by normal impacts caused by people or by thrown or kicked objects.

8 Behaviour in relation to fire

8.1 The overall classification for the complete system in accordance with BS EN 13501-1 : 2007, is B2-s1, d0.

8.2 These ratings apply to the full range of colours covered by this Certificate.

8.3 The enhanced EPS insulation material in isolation is classified as combustible.

8.4 Requirements under the various national Building Regulations are:

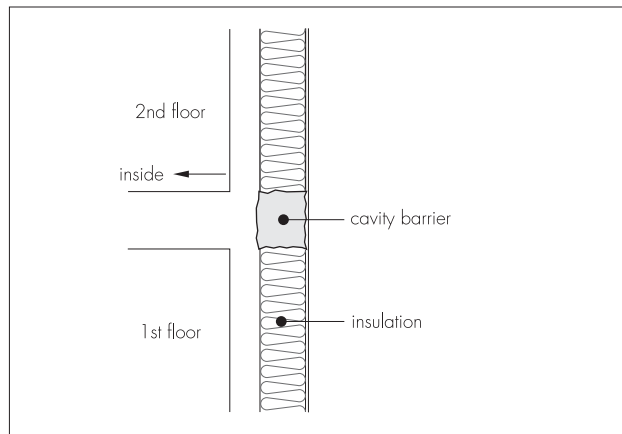
England, Wales and Northern Ireland

- The system is considered suitable for use on or at any distance from the boundary, provided the wall meets the fire resistance requirements in Tables A1 and A2
- The system is restricted for use in buildings less than 18 m in height.

Scotland

- The system must not be used within 1 m of the boundary and is restricted for use in buildings less than 18 m in height
- The system is not classified as 'non-combustible'; therefore, must be regarded as unprotected areas unless it is attached to the structure of the building and the external wall does not contain openings other than the small openings described in Mandatory Standard 2.6.2, clause 2.6.2b, and the wall behind the cladding has the appropriate fire-resistance duration from the inside (see Annex 2.A and 2.D of the Domestic and Non-Domestic Technical Handbooks respectively).

Figure 3 Cavity barrier



8.5 The insulation system covered by this Certificate does not incorporate cavities between the insulation and the substrate; however, fire barriers should be incorporated into a construction where required by the relevant Building Regulations, to maintain the continuity of fire resistance. Further details are given in BRE Report (BR 135 : 2013) and in:

England and Wales — Approved Document B, Volume 1, Section 6, and Volume 2, Section 9

Scotland — Mandatory Standard 2.4, clauses 2.4.1⁽¹⁾⁽²⁾, 2.4.2⁽¹⁾⁽²⁾, 2.4.7⁽¹⁾ and 2.4.9⁽²⁾

(1) Technical Handbook (Domestic).

(2) Technical Handbook (Non-Domestic).

Northern Ireland — Technical Booklet E, Section 3, paragraphs 4.36 to 4.40.

8.6 In multi-storey applications, at least one 8 mm diameter stainless steel fixing (in addition to those of plastics) per square metre of insulation is required. The anchor is applied to prevent collapse should the insulation be lost to fire and must be designed to resist the bending and shear stresses resulting from the dead load from the render.

9 Proximity of flues and appliances

When the system is installed in close proximity to certain flue pipes the relevant provisions of the national Building Regulations should be met:

England and Wales — Approved Document J

Scotland — Mandatory Standard 3.19, clause 3.19.4⁽¹⁾⁽²⁾

(1) Technical Handbook (Domestic).

(2) Technical Handbook (Non-Domestic).

Northern Ireland — Technical Booklet L.

10 Rain penetration



10.1 The system will provide a degree of protection against rain ingress. However, care should be taken to ensure that substrate walls are adequately weathertight prior to its application. The insulation system shall only be installed where there are no signs of dampness on the inner surface of the substrate other than those caused solely by condensation.

10.2 Designers and installers should take particular care in detailing around openings, penetrations and movement joints to minimise the risk of rain ingress; only details approved by the Certificate holder should be used.



10.3 For externally insulated single-leaf masonry walls, guidance is given in BS EN 1996-1-1 : 2005 and its UK National Annex and BS EN 998-2 : 2010 on the minimum thickness of render required for the different exposure categories.

10.4 The guidance given in BRE Report (BR 262 : 2002) should be followed in connection with the weathertightness of solid wall constructions. The designer should select a construction appropriate to the local wind-driven rain index, paying due regard to the design detailing, workmanship and materials to be used.

10.5 At the tops of walls, the system should be protected by an adequate overhang or other detail designed for use with this type of system.

11 Risk of condensation



11.1 Designers must ensure that an appropriate condensation risk analysis has been carried out for all parts of a construction, including at junctions, openings and penetrations to minimise the risk of condensation. The recommendation of BS 5250 : 2011 should be followed.

Surface condensation



11.2 Walls will limit the risk of surface condensation adequately when the thermal transmittance (U value) does not exceed $0.7 \text{ W}\cdot\text{m}^{-2}\cdot\text{K}^{-1}$ at any point and the junctions with other elements are designed in accordance with the relevant requirements of the publications referred to in section 4 of this Certificate.



11.3 Walls will adequately limit the risk of surface condensation when the thermal transmittance (U value) does not exceed $1.2 \text{ W}\cdot\text{m}^{-2}\cdot\text{K}^{-1}$ at any point. Guidance may be obtained from BS 5250 : 2011 (Section 4 and Annex G) and BRE Report (BR 262 : 2002).

Interstitial condensation



11.4 Walls incorporating the system will adequately limit the risk of interstitial condensation when they are designed and constructed in accordance with BS 5250 : 2011 (Section 4 and Annexes D and G).

11.5 The system has a water vapour resistance such that, under the conditions likely to occur in a dwelling in the United Kingdom, interstitial condensation should not occur within the insulation.

11.6 If the system is to be used on the external walls of rooms expected to have continuous high humidities, care must be taken in the design of the rooms to avoid possible problems from the formation of interstitial condensation.

11.7 The water vapour resistivity of the EPS boards can be taken as between $100 \text{ MN}\cdot\text{s}\cdot\text{g}^{-1}\cdot\text{m}^{-1}$ and $200 \text{ MN}\cdot\text{s}\cdot\text{g}^{-1}\cdot\text{m}^{-1}$.

12 Maintenance and repair



12.1 Regular checks should be made on the installed insulation system, particularly at joints with other elements, to ensure that ingress of water does not occur. Checks should verify that architectural details for shedding water clear of the building are present and functioning, and that external plumbing fittings are in good condition.

Maintenance schedules should include the replacement and resealing of joints, for example between the insulation system and window and door frames. The interval between inspections should be considered for each building taking into account such factors as the building location and height.

12.2 Damaged areas must be repaired using the appropriate components and the procedures detailed in the Certificate holder's installation instructions.

13 Durability



13.1 The system will remain effective for at least 30 years, provided any damage to the surface finish is repaired immediately, and regular maintenance is undertaken as described in Section 12.

13.2 The render may become discoloured with time, the rate depending on the initial colour, the degree of exposure and atmospheric pollution, as well as the design and detailing of the wall. In common with traditional renders, discoloration by algae and lichens may occur in wet areas. The appearance may be restored by a suitable power wash or, if required, by over coating.

Installation

14 Site survey and preliminary work

14.1 A pre-installation survey of the property is carried out to determine suitability for treatment and the need for any necessary repairs to the building structure before application of the K Rend External Wall Insulation System 1. A specification is prepared for the building indicating:

- the position of beads
- detailing around windows, doors and at eaves
- damp-proof course (dpc) level
- exact position of expansion joints
- areas where flexible sealants must be used
- any alterations to external plumbing
- where required, the position of fire barriers.

14.2 The survey should include tests conducted on the walls of the building by the Certificate holder or their approved applicators (see section 15) to determine the adequacy of the substrate. Trial tests are conducted on the wall to determine the pull-out resistance of the proposed mechanical fixings. An assessment and recommendation is made on the type and number of fixings required to withstand the building's expected wind loading based on calculations using the test data, the relevant wind speed data for the site and, in the absence of a formal requirement, a safety factor of 2 is applied (see Table 4).

14.3 It is recommended that external plumbing should be removed before installation and alterations made to underground drainage, where appropriate, to accommodate repositioning of the plumbing on the finished face of the system.

14.4 New buildings should be of sound masonry, dense or no-fines concrete construction.

14.5 Surfaces should be sound, clean and free from loose material. The flatness of surfaces must be checked; this may be achieved using a straight-edge spanning the storey height. Any excessive irregularities, ie greater than 10 mm in 1 m, must be made good prior to installation to ensure that the insulation boards are installed with a smooth, in-plane finished surface.

14.6 On existing buildings, purpose-made window sills must be fitted to extend beyond the finished face of the system (see Figure 6). New buildings should incorporate suitably deep sills.

14.7 Where surfaces are covered with an existing render, it is essential that the bond between the background and the render is adequate. All loose areas should be hacked off and reinstated.

14.8 Internal wet work, eg screeding or plastering, should be completed and allowed to dry prior to the application of a system.

14.9 All modifications, such as provision for cavity barriers and fire stopping (see section 8) and necessary repairs to the building are completed before installation commences.

15 Approved installers

Application of the system, within the context of this Certificate, is carried out by approved installers recommended or recognised by the Certificate holder. Such an installer is a company:

- employing operatives who have been trained and approved by the Certificate holder to install the system
- which has undertaken to comply with the Certificate holder's application procedure, containing the requirement for each application team to include at least one member operative trained by the Certificate holder
- subject to at least one inspection per annum by the Certificate holder to ensure suitable site practices are being employed. This may include unannounced site inspections.

16 Procedure

General

16.1 Installation is carried out in accordance with the current installation instructions of the Certificate holder.

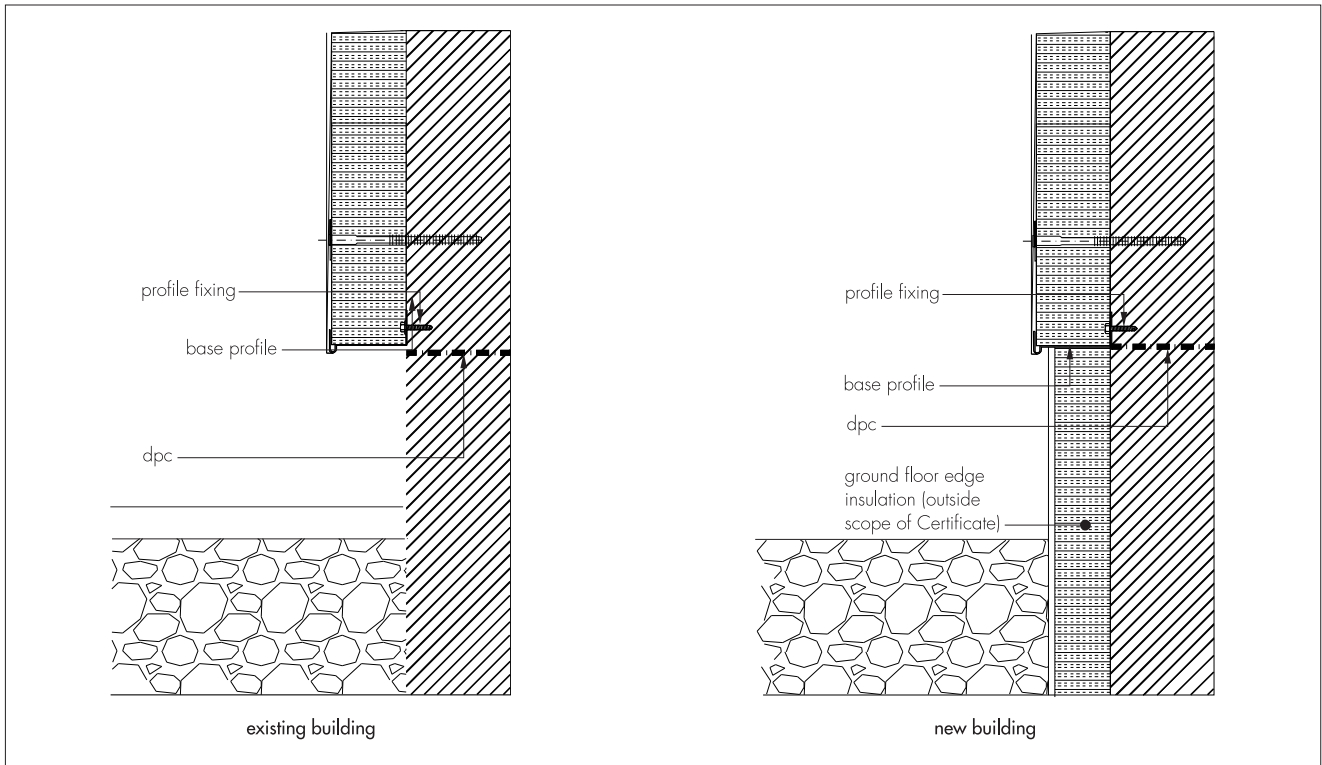
16.2 Weather conditions should be monitored to ensure correct application and curing conditions. The render should not be applied at temperatures below 5°C or above 30°C, if exposure to frost is likely or in damp/wet conditions. The render must be protected from rapid drying and should not be applied on elevations in direct sunlight.

16.3 All rendering should be in accordance with the relevant recommendations of BS EN 13914-1 : 2005.

Positioning and securing insulation boards

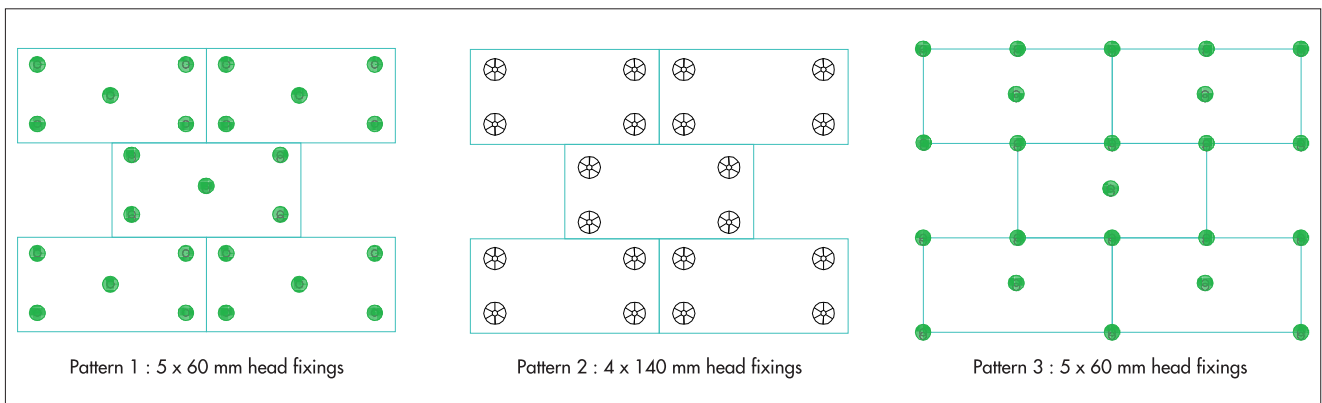
16.4 The base profile is secured to the external wall above the dpc using approved profile fixings at 300 mm maximum centres (see Figure 4). Beads and expansion joints are incorporated as specified.

Figure 4 Typical section at base level



16.5 The insulation boards are securely fixed to the substrate starting at the base profile level using the project-specific fixing type and layout as shown in the project specification and drawings (see Figure 5).

Figure 5 Typical fixing pattern



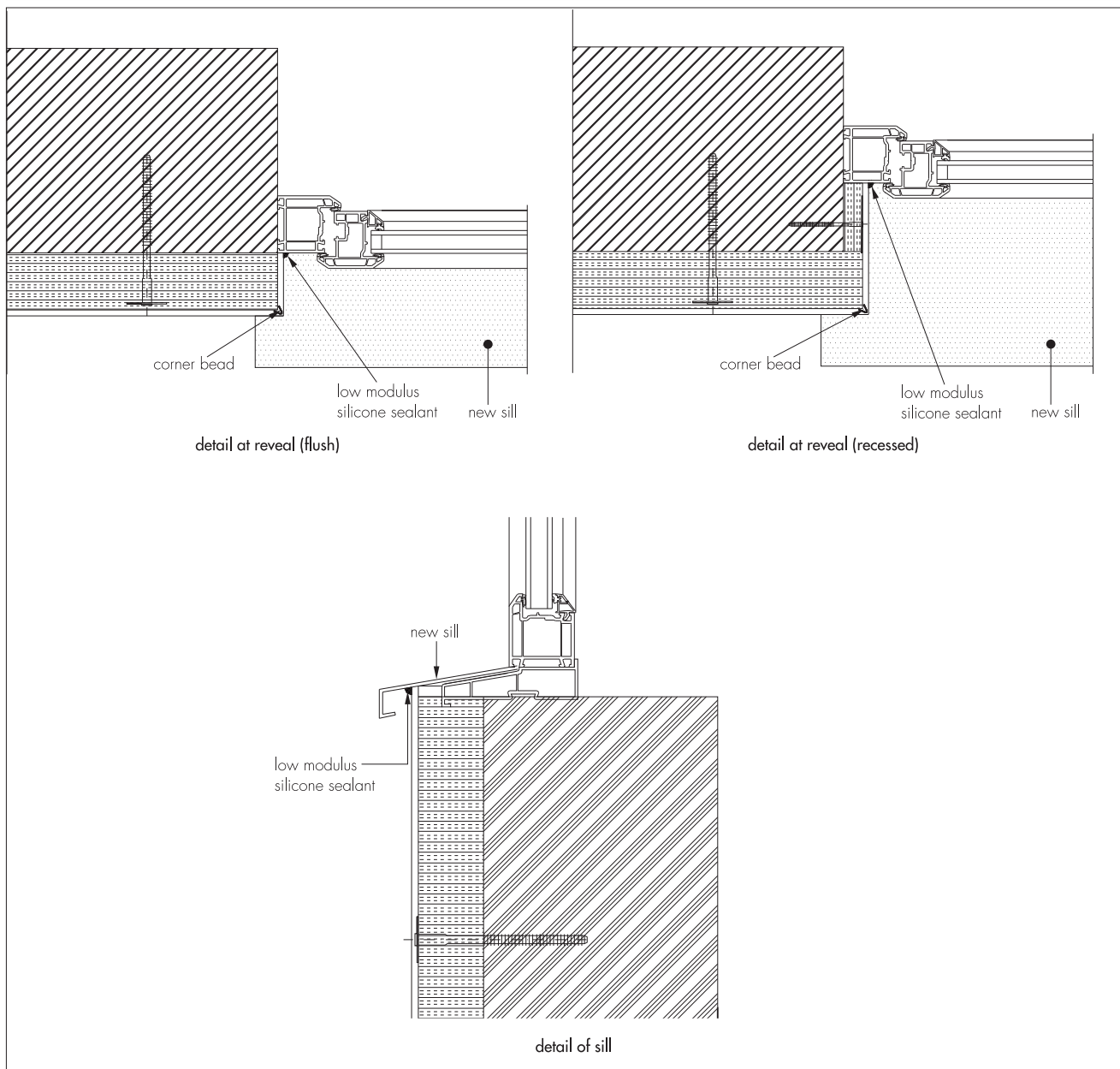
16.6 The boards are always laid in brick bond fashion (see Figure 5). Care is taken to ensure that the boards are fitted tight to each other. The boards are interlocked on the external corners. Gaps are filled with expanding PUR foam. The line and level are checked as work progresses.

16.7 The first run of insulation boards is positioned on the base profile.

16.8 The fixings are installed by drilling through the insulation and into the substrate. Care is taken to ensure that the depth of embedment of the fixing into the substrate is as specified. Allowance is made where either existing render is on the wall or dubbing out render has been used to align the boards as the effective embedment will be reduced. The fixings are either hammered or screwed in depending on the type specified.

16.9 To fit around details such as doors and windows, insulation boards may be cut with a sharp knife or a fine-toothed saw. If required, purpose-made window sills are fitted at this stage. They are designed to prevent water ingress and incorporate drips to shed water clear of the system (see Figure 6).

Figure 6 Details around openings

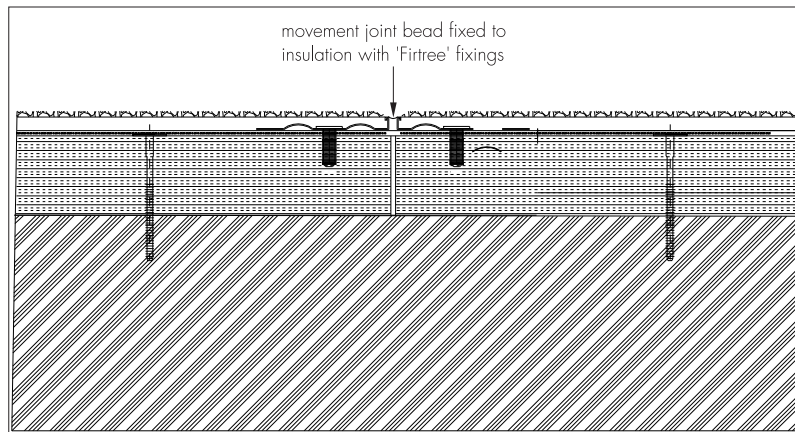


16.10 Installation continues until the whole wall is completely covered including, where appropriate, the building soffits.

Movement joints and render beads

16.11 Movement joints in the substrate must be continued through the system. This may necessitate the use of back-to-back full system stop beads with a sealant and backer strip depending on the width of the joint and the degree of movement anticipated. Additional movement joints in the insulation system are determined by the Certificate holder at the time of initial survey (see Figure 7).

Figure 7 Expansion joint

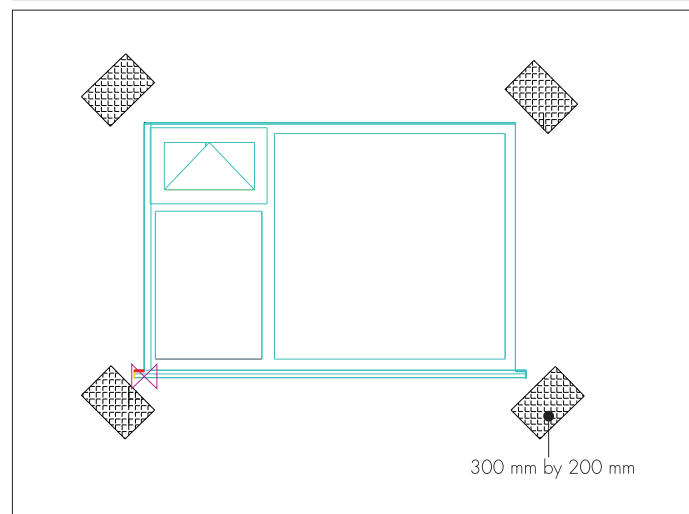


Reinforcing

16.12 The K Rend HP14 Base should be mixed with from 4 to 5 litres of potable water per 25 kg bag for a minimum of 5 minutes with an electric paddle mixer to disperse the additives. Conventional concrete mixers are unsuitable for this purpose. Corner beads with integral glassfibre wings should be fitted to all corners using the K Rend HP14 Base. A thickness of 3 mm of the basecoat should be applied to the surface of the insulation using a stainless steel trowel or a render pump. The glassfibre mesh should be embedded in the wet render using the trowel. The sheets of mesh should be lapped by a minimum of 100 mm. Diagonal patches of mesh approximately 300 mm by 200 mm should also be installed at the corners of window/door openings (see Figure 8).

16.13 The second 3 mm thick coat of basecoat should be applied to give a total render thickness of 6 mm. The surface of the basecoat should be sponged, to provide a smooth surface for the K Rend Primer TC and K Rend Acrylic TC finish.

Figure 8 Additional reinforcement at openings



Render finish

16.14 The basecoat should be left to dry thoroughly before the application of K Rend Acrylic TC. Depending on the prevailing conditions, the render may take three days to dry/cure completely prior to the application of the primer/finish.

16.15 The primer is applied to the basecoat in accordance with the Certificate holder's instructions and allowed to dry for approximately 24 hours prior to the application of the K Rend Acrylic TC finishing coat.

16.16 The finishing coat should be applied in accordance with the Certificate holder's instructions.

16.17 Care should be taken in the detailing of the system around features such as openings, projections and at eaves (see Figure 6) to ensure adequate protection against water ingress and to limit the risk of water penetrating the system.

16.18 On completion, external fittings are re-fixed to the substrate using suitable fixing pads previously installed in the systems.

16.19 On completion, external fittings, eg rainwater goods, are re-fixed through the system into the substrate.

17 Tests

An examination was made of data relating to:

- resistance to freeze/thaw
- heat/spray cycling
- impact resistance
- component characterisation
- water vapour permeability
- fire performance
- durability of finish
- pull-out strength of fixings
- thermal conductivity.

18 Investigations

18.1 The manufacturing process, the methods adopted for quality control of manufactured and bought-in components, and details of the quality and composition of the materials used were examined.

18.2 An assessment of the risk of interstitial condensation was undertaken.

18.3 The practicability of installation and the effectiveness of detailing techniques were examined.

Bibliography

BS 5250 : 2011 *Code of practice for control of condensation in buildings*

BS 8000-3 : 2001 *Workmanship on building sites — Code of practice for masonry*

BS EN 998-2 : 2010 *Specification for mortar for masonry — Masonry mortar*

BS EN 1990 : 2002 *Eurocode — Basis of structural design*

NA to BS EN 1990 : 2002 *UK National Annex to Eurocode — Basis of structural design*

BS EN 1991-1-4 : 2005 *Eurocode 1 — Actions on structures — General actions — Wind actions*

NA to BS EN 1991-1-4 : 2005 *UK National Annex to Eurocode 1 — Actions on structures — General actions — Wind actions*

BS EN 1996-1-1 : 2005 *Eurocode 6 — Design of masonry structures — General rules for reinforced and unreinforced masonry structures*

NA to BS EN 1996-1-1 : 2005 *UK National Annex to Eurocode 6 — Design of masonry structures — General rules for reinforced and unreinforced masonry structures*

BS EN 1996-2 : 2006 *Eurocode 6 — Design of masonry structures — Design considerations, selection of materials and execution of masonry*

NA to BS EN 1996-2 : 2006 *UK National Annex to Eurocode 6 — Design of masonry structures — Design considerations, selection of materials and execution of masonry*

BS EN 10088-1 : 2005 *Stainless steels — List of stainless steels*

BS EN 10327 : 2004 *Continuously hot-dip coated strip and sheet of low carbon steels for cold forming — Technical delivery conditions*

BS EN 13163 : 2008 *Thermal insulation products for buildings — Factory made products of expanded polystyrene (EPS) — Specification*

BS EN 13438 : 2005 *Paints and varnishes — Powder organic coatings for galvanized or sherardised steel products for construction purposes*

BS EN 13501-1 : 2007 *Fire classification of construction products and building elements — Classification using test data from reaction to fire tests*

BS EN 13914-1 : 2005 *Design, preparation and application of external rendering and internal plastering — External rendering*

BS EN ISO 6946 : 2007 *Building components and building elements — Thermal resistance and thermal transmittance — Calculation method*

BRE Report (BR 135 : 2013) *Fire Performance of External Insulation for Walls of Multi-storey Buildings*

BRE Report (BR 262 : 2002) *Thermal insulation: avoiding risks*

ETAG 004 : 2011 *Guideline for European Technical Approval of External Thermal Insulation Composite Systems with Rendering*

ETAG 014 : 2002 *Guideline for European Technical Approval of Plastic Anchors for fixing of External Thermal Insulation Composite Systems with Rendering*

19 Conditions

19.1 This Certificate:

- relates only to the product/system that is named and described on the front page
- is issued only to the company, firm, organisation or person named on the front page — no other company, firm, organisation or person may hold or claim that this Certificate has been issued to them
- is valid only within the UK
- has to be read, considered and used as a whole document — it may be misleading and will be incomplete to be selective
- is copyright of the BBA
- is subject to English Law.

19.2 Publications, documents, specifications, legislation, regulations, standards and the like referenced in this Certificate are those that were current and/or deemed relevant by the BBA at the date of issue or reissue of this Certificate.

19.3 This Certificate will remain valid for an unlimited period provided that the product/system and its manufacture and/or fabrication, including all related and relevant parts and processes thereof:

- are maintained at or above the levels which have been assessed and found to be satisfactory by the BBA
- continue to be checked as and when deemed appropriate by the BBA under arrangements that it will determine
- are reviewed by the BBA as and when it considers appropriate.

19.4 The BBA has used due skill, care and diligence in preparing this Certificate, but no warranty is provided.

19.5 In issuing this Certificate, the BBA is not responsible and is excluded from any liability to any company, firm, organisation or person, for any matters arising directly or indirectly from:

- the presence or absence of any patent, intellectual property or similar rights subsisting in the product/system or any other product/system
- the right of the Certificate holder to manufacture, supply, install, maintain or market the product/system
- actual installations of the product/system, including their nature, design, methods, performance, workmanship and maintenance
- any works and constructions in which the product/system is installed, including their nature, design, methods, performance, workmanship and maintenance
- any loss or damage, including personal injury, howsoever caused by the product/system, including its manufacture, supply, installation, use, maintenance and removal
- any claims by the manufacturer relating to CE marking.

19.6 Any information relating to the manufacture, supply, installation, use, maintenance and removal of this product/system which is contained or referred to in this Certificate is the minimum required to be met when the product/system is manufactured, supplied, installed, used, maintained and removed. It does not purport in any way to restate the requirements of the Health and Safety at Work etc. Act 1974, or of any other statutory, common law or other duty which may exist at the date of issue or reissue of this Certificate; nor is conformity with such information to be taken as satisfying the requirements of the 1974 Act or of any statutory, common law or other duty of care.