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BBA APPROVAL INSPECTION TESTING CERTIFICATION
TECHNICAL APPROVALS FOR CONSTRUCTION

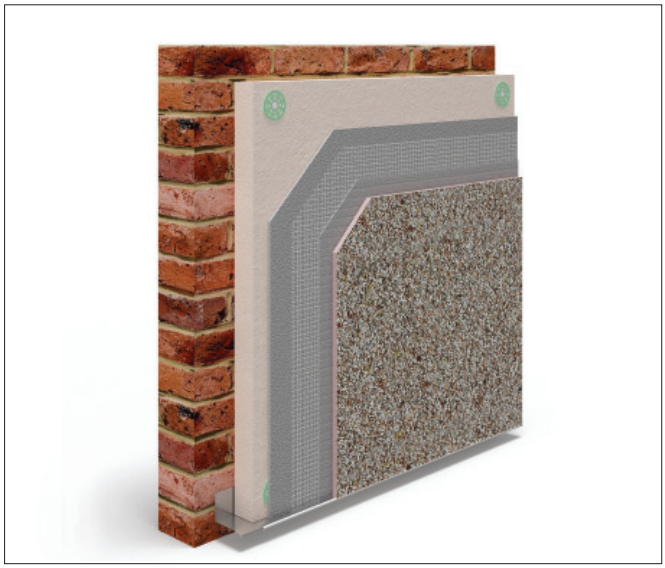
Agrément Certificate
03/4058
Product Sheet 2

EPSICON EXTERNAL WALL INSULATION SYSTEMS

EPSICON 3 EXTERNAL WALL INSULATION SYSTEM

PRODUCT SCOPE AND SUMMARY OF CERTIFICATE

This Certificate relates to the Epsicon 3 External Wall Insulation System, comprising mechanically-fixed phenolic, PIR-modified urethane, expanded polystyrene (EPS) or mineral wool insulation with a glassfibre reinforced render coat and render finish, and suitable for use on new or existing domestic and non-domestic buildings.



AGRÉMENT 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

Practicability of installation — the system must be installed by trained operatives (see section 4).

Strength and stability — a correctly designed system will have adequate resistance to wind loads (see section 5).

Behaviour in relation to fire — the system has a Class 0 surface spread of flame classification (see section 6).

Thermal performance — use of the system can enable a construction to meet, or contribute to meeting, the building regulations (see section 10).

The BBA has awarded this Agrément 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: 18 July 2011

Originally certificated on 30 March 2004

Brian Chamberlain
Head of Approvals — Engineering

Greg Cooper
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 Epsicon 3 External Wall Insulation System, if used in accordance with the provisions of this Certificate, will meet or contribute to meeting the relevant requirements of the following Building Regulations:



The Building Regulations 2010 (England and Wales)

Requirement:	A1	Loading
Comment:		The system can sustain and transmit wind loads to the substrate wall. See sections 5.7 and 5.11 of this Certificate.
Requirement:	B4(1)	External fire spread
Comment:		The system is classified Class 0 and can, therefore, meet this Requirement. See sections 6.1 to 6.3 and 6.6 of this Certificate.
Requirement:	C2(b)(c)	Resistance to moisture
Comment:		The system provides a degree of protection against rain ingress and contributes to minimising the risks of interstitial and surface condensation. See sections 8.2, 8.3, 9.7, 9.9 and 9.10 of this Certificate.
Requirement:	L1(a)(i)	Conservation of fuel and power
Comment:		The system can enable or contribute to enabling a construction to meet the Target Emission Rate. See sections 10.3 and 10.4 of this Certificate.
Requirement:	Regulation 7	Materials and workmanship
Comment:		The system is acceptable. See section 12.1 and the *Installation* part 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 11.1 and 12.1 and the *Installation* part of this Certificate.
Regulation:	9	Building standards — construction
Standard:	1.1	Structure
Comment:		The system can sustain and transmit wind loads to the substrate wall. See sections 5.7 and 5.11 of this Certificate.
Standard:	2.6	Spread to neighbouring buildings
Comment:		The system has a 'low risk' surface classification. The system incorporates materials which would not be classed as 'non-combustible'. Completed walls, therefore, would be regarded as unprotected areas as defined in this Standard, with reference to clauses 2.6.1[(1)(2)], 2.6.2[(1)(2)], 2.6.4[(1)(2)], 2.6.5[(1)] and 2.6.6[(2)]. See sections 6.1 to 6.3, and 6.6 of this Certificate.
Standard:	2.7	Spread on external walls
Comment:		The system incorporates materials which would not be classed as 'non-combustible' as defined in this Standard under clauses 2.7.1[(1)(2)] and 2.7.2[(2)] and should not, therefore, be used on walls one metre or less from a boundary. See sections 6.1 to 6.3, and 6.6 of this Certificate.
Standard:	3.10	Precipitation
Comment:		Walls insulated with the system can satisfy this Standard, with reference to clauses 3.10.1[(1)(2)] and 3.10.6[(1)(2)]. See section 8.2 of this Certificate.
Standard:	3.15	Condensation
Comment:		Walls insulated with the system can satisfy the requirements of this Standard, with reference to clauses 3.15.1[(1)], 3.15.4[(1)] and 3.15.5[(1)]. See sections 9.7 and 9.8 of this Certificate.
Standards:	6.1(b)	Carbon dioxide emissions
	6.2	Building insulation envelope
Comment:		The system can contribute to satisfying these Standards, with reference to clauses (or parts of) 6.1.1[(1)], 6.1.2[(1)(2)], 6.1.3[(2)], 6.1.5[(2)], 6.1.6[(1)], 6.2.1[(1)], 6.2.3[(1)], 6.2.4[(1)], 6.2.5[(1)(2)] and 6.2.10[(2)]. See sections 10.3 and 10.4 of this Certificate.
		(1) Technical Handbook (Domestic).
		(2) Technical Handbook (Non-Domestic).



The Building Regulations (Northern Ireland) 2000 (as amended)

Regulation:	B2	Fitness of materials and workmanship
Comment:		The system is acceptable. See section 12.1 and the *Installation* part of this Certificate.
Regulation:	B3(2)	Suitability of certain materials
Comment:		The system is acceptable. See section 11.1 of this Certificate.
Regulation:	C4(b)	Resistance to ground moisture and weather
Comment:		Walls insulated with the system can satisfy this Regulation. See section 8.2 of this Certificate.
Regulation:	C5	Condensation
Comment:		Walls insulated with the system can satisfy the requirements of this Regulation. See section 9.8 of this Certificate.
Regulation:	D1	Stability
Comment:		The system can sustain and transmit wind loads to the substrate wall. See sections 5.7 and 5.11 of this Certificate.

Regulation:	E5(a)	External fire spread
Comment:		The system has a Class 0 classification surface and can satisfy this Regulation. See sections 6.1 to 6.3 and 6.6 of this Certificate.
Regulations:	F2(a)(i)	Conservation measures
	F3(2)	Target carbon dioxide Emissions Rate
Comment:		The system can enable a construction to meet the requirements of these Regulations. See sections 10.3 and 10.4 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: 2 *Delivery and site handling* (2.1).

Non-regulatory Information

NHBC Standards 2011

NHBC accepts the use of the Epsicon 3 External Wall Insulation System for masonry walls, when installed and used in accordance with this Certificate, in relation to *NHBC Standards*, Chapter 6.9 *Curtain walling and cladding*.

General

This Certificate relates to the Epsicon 3 External Wall Insulation System, comprising mechanically-fixed phenolic, PIR-modified polyurethane, expanded polystyrene (EPS) or mineral wool insulation with a glassfibre reinforced render coat and render finish

The system is applied to the outside of external walls of masonry or dense concrete constructions and is suitable for use on new or existing domestic and 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.

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

Technical Specification

1 Description

1.1 The Epsicon 3 External Wall Insulation System (see Figure 1) uses one of four types of insulation (see section 1.2) mechanically fixed to the substrate wall with anchors approved by the Certificate holder.

1.2 The components of the basic wall system (see Figures 1 and 2), from outer to inner, comprise:

- topcoat — lightweight dash receiver — a cement-based, ready-mixed render supplied as a powder to which clean water is added and comprises limestone sand conforming to BS 1199 : 1976 and BS 1200 : 1976, cement to BS EN 197-1 : 2000, hydrated lime to BS EN 459-1 : 2001, lightweight aggregates, polypropylene fibres and polymers
- lightweight basecoat render — a cement-based, ready-mixed render supplied as a powder to which clean water is added and comprises limestone sand conforming to BS 1199 : 1976 and BS 1200 :1976, cement to BS EN 197-1 : 2000, lightweight aggregates and polypropylene fibres
- reinforcing scrim — a multi-stranded, alkali-resistant glassfibre, with a polymer coating and a nominal weight of 160 $g \cdot m^{-2}$
- mechanical fixing — an anchor used in external thermal insulation composite systems (ETICS), incorporating a 60 mm diameter plate with a central hole to accommodate a 3 mm diameter self-drilling screw of adequate length to suit the insulation thickness (see Figure 3). Stainless steel fixings are used where required. See the Certificate holder for details
- Insulation:
  - phenolic insulation boards — 1200 mm by 600 mm in a range of thicknesses between 20 mm and 130 mm. Boards are available with a nominal density of 40 $kg \cdot m^{-3}$ or 50 $kg \cdot m^{-3}$, a minimum compressive strength of 150 $kN \cdot m^{-2}$ or 120 $kN \cdot m^{-2}$, respectively
  - PIR-modified urethane insulation boards — 1200 mm by 600 mm in a range of thicknesses between 20 mm and 90 mm, with a nominal density of 32 $kg \cdot m^{-3}$, a minimum compressive strength of 150 $kN \cdot m^{-2}$. Boards of 15 mm thickness are also available for use in window reveals
  - expanded polystyrene insulation boards — 1200 mm by 600 mm in a range of thicknesses between 40[1] mm and 240 mm. The boards are manufactured to comply with the requirements for EPS 70 Class E material to BS EN 13163 : 2001 and have a minimum compressive strength of 150 $kN \cdot m^{-2}$

(1) For details of insulation less than 40 mm thick, the advice of the Certificate holder should be sought.

— mineral wool insulation slabs — 1200 mm by 600 mm in a range of thicknesses between 30[1] mm and 240 mm, with a nominal density of 140 kg·m^{-3} manufactured to BS EN 3958-5 : 1986 and have a minimum compressive strength of 150 kN·m^{-2}.

(1) For details of insulation less than 30 mm thick, the advice of the Certificate holder should be sought.

Figure 1 Epsicon 3 External Wall Insulation System

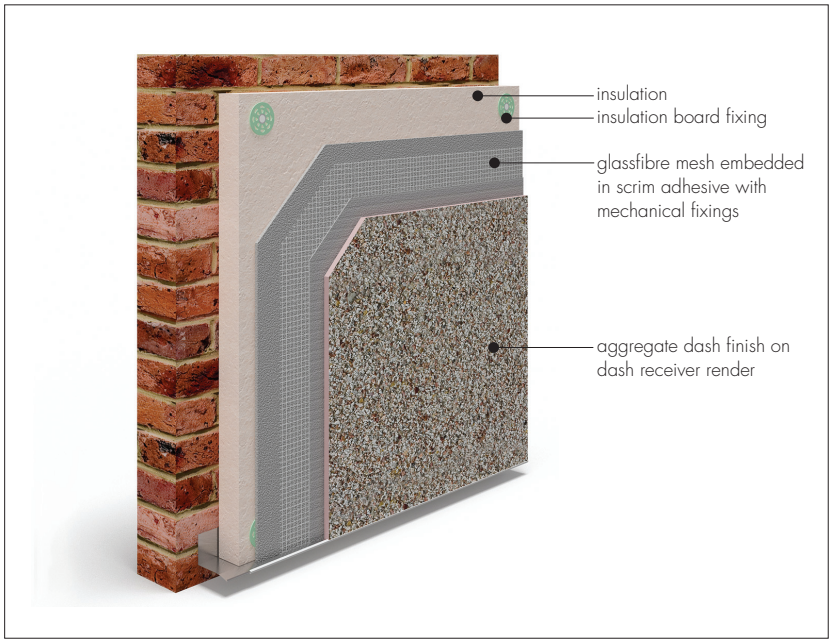
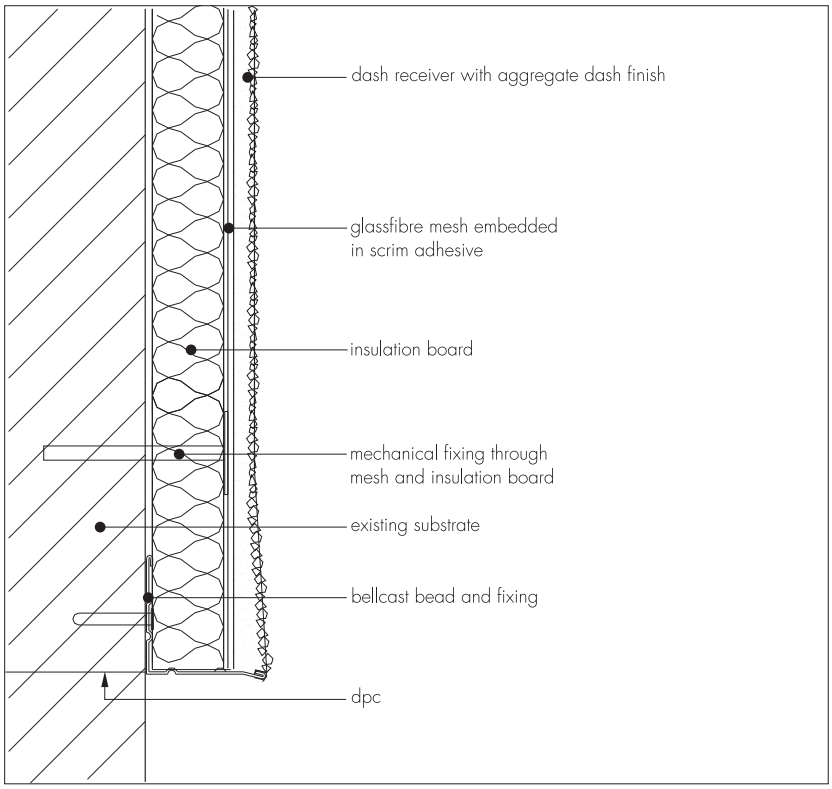


Figure 2 Typical section at base level



1.3 Ancillary items supplied by the Certificate holder for use in particular locations/forms of construction include:

- profiles — a range of standard profiles, typically for wall base, end stop, corner mesh, and expansion joint. Profiles are available in stainless steel or organic polyester powder-coated galvanized steel and are provided to the specifier's requirements and approved by the Certificate holder
- profile fixings — hammer screws with plastic expansion sleeves as approved by the Certificate holder
- sealant — silicone mastic as approved by the Certificate holder
- spardash aggregate as approved by the Certificate holder.

1.4 Ancillary items which are outside the scope of this Certificate and not supplied by the Certificate holder, but which may be required to ensure the completed construction complies with the building regulations and is fit for purpose, include:

- sealant
- fire stops.

2 Delivery and site handling

2.1 Components are delivered in the packaging and quantities listed in Table 1. Each basecoat bag carries the product identification and manufacturer's batch number.

Table 1 Component supply details

Component	Quantity and packaging
Insulation	Polythene wrapped
Reinforcing scrim	1 m by 50 m rolls
Basecoat/dash receiver	25 kg bag
Mechanical fixings	Boxed by manufacturer

2.2 The insulation must be protected from prolonged exposure to sunlight either by storing opened packs under cover or re-covering with opaque sheeting. In addition, the insulation should be stored on a firm, clean, level base, off the ground and under cover until required for use. Care must be taken when handling the insulation boards to avoid both damage and, where required, contact with solvents or bitumen products. The boards must not be exposed to open flame or other ignition sources.

2.3 The basecoat and finishes must be stored in dry conditions, off the ground, and protected from moisture and frost.

Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on the Epsicon 3 External Wall Insulation System.

Design Considerations

3 General

3.1 The Epsicon 3 External Wall Insulation System is effective in reducing the thermal transmittance (U value) of the walls in new and existing buildings. 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.

3.2 The system is applied to the outside of external walls of masonry or dense concrete constructions. It is suitable for use on new or existing domestic and non-domestic buildings.

3.3 The system will improve the weather resistance of a wall and provide a decorative finish. However, it may only be installed where other routes for 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 insulation system can be used to overcome condensation occurring on an internal wall surface.

3.4 Existing buildings should have exterior wall surfaces in accordance with section 13 *Site survey and preliminary work* in the *Installation* section of this Certificate.



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

- BS EN 1996-1-1 : 2005, BS EN 1996-1-2 : 2005, BS EN 1996-2 : 2006 and BS EN 1996-3 : 2006
- BS 5628-3 : 2005, with particular reference to Clause 5.5 Exclusion of water
- BS 8000-3 : 2001.

3.6 Other walls not subject to regulatory requirements should also be built in accordance with section 3.6.



3.7 When using the system, the recommendations of BS 5250 : 2002 should be followed and consideration given to the overall design to minimise the risk of condensation.

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

3.9 The effect of the installation of the insulation systems on the acoustic performance of a construction is also outside the scope of this Certificate.

3.10 It is essential that the insulation systems are installed and maintained in accordance with the conditions set out in this Certificate.

3.11 Movement joints in the substrate must be continued through the system (see section 15).

4 Practicability of installation

The system should only be installed or maintained by contractors trained and approved by the Certificate holder and in accordance with the Certificate holder's Installation Manual (see section 14).

5 Strength and stability

5.1 The resistance to wind loads will depend upon the insulation system used. The systems can be designed to provide adequate resistance to design loads applicable in the UK.

5.2 Provided the substrate wall is suitable, and an appropriate fixing is used, the mechanical fixings and starter track at the base will transfer the weight of the render insulation system to the supporting wall. The number of fixings and the span between fixings should be determined by the system designer. The fixing must be selected to give adequate support to the weight of the system at the minimum spacing given in this Certificate.

5.3 The condition of the surface to receive the product is not a consideration provided the fastenings are anchored into a substrate capable of supporting the loads imposed by the external insulation and the forces acting upon it. Trial tests are conducted on the walls of the building to determine the pull-out strength of the fastenings.

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

5.5 Negative wind pressure (suction) is resisted by the bond between each component; the insulation boards are retained by the fixing anchor and secured through the reinforcing layer, to the wall with the appropriate fixings.



5.6 The wind loads on the wall should be calculated in accordance with BS EN 1991-1-4 : 2005 or BS 6399-2 : 1997. 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, it is recommended that a load factor of 1.5 is used to determine the ultimate wind load to be resisted by the system.

5.7 Assessment of structural performance for individual buildings should be carried out by a suitably qualified engineer or other appropriately qualified 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) (see section 5.8).

5.8 An appropriate number of site-specific pull-out tests are conducted on the substrate of the building to determine the minimum resistance to failure of the fixings. The characteristic pull-over resistance should be determined in accordance with the guidance given in Annex D of ETAG 014 : 2002 using 60% of the mean value of the five smallest measured values at the ultimate load.

5.9 When assessing the resistance to wind loads an appropriate safety factor should be used. This should be determined in accordance with BS EN 1990 : 2002. If there is no other information available, a safety factor of 3 can be used.

Impact loading



5.11 The systems have adequate resistance to impact and abrasion where walls are exposed and have some protection, eg walls of private dwellings or walls of communal dwellings 1.5 m to 6 m above pedestrian or ground floor level.

6 Behaviour in relation to fire



6.1 The external surfaces of the system are classified as Class 0 or 'low risk' as defined in the documents supporting the national Building Regulations. The system, therefore, may be used in accordance with the provisions of:

England and Wales — Approved Document B, Volume 1, paragraph 8.4, and Volume 2, paragraph 12.6 (see also Approved Document B, Volume 2, Diagram 40)

Scotland — Mandatory Standards 2.6 and 2.7, clauses 2.6.1[(1)(2)] to 2.6.5[(1)(2)], 2.6.6[(2)], 2.6.7[(2)], 2.7.1[(1)(2)] and 2.7.2[(2)] respectively, and Annexes 2.C[(1)] and 2.E[(2)]

Northern Ireland — Technical Booklet E, paragraph 4.3 (see also Diagram 4.1).

(1) Technical Handbook (Domestic).
(2) Technical Handbook (Non-Domestic).

6.2 The documents listed in section 6.1 give full details of permissible heights and boundary conditions of domestic and non-domestic buildings and the relevant guidance with regard to external wall claddings of external wall insulation systems with render surfaces. However, the following information is offered for guidance purposes:

England and Wales

- for buildings one metre or more from a boundary, the system is acceptable
- for buildings less than one metre from a boundary, the system can be acceptable provided the wall meets the fire resistance requirements in Tables A1 and A2, from both sides
- the system can be acceptable, subject to the aforementioned conditions, for use on a building which has a floor up to 18 m above ground level.

Scotland

- domestic and non-domestic use — for buildings more than one metre from a boundary, up to 18 m above ground level, the system can be acceptable. The system is not classified as non-combustible, therefore calculations for unprotected areas apply[1].

(1) Combustible cladding need not be included in the calculation for unprotected areas where 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. In Mandatory Standard 2.6, clause 2.6.2b, an unprotected area is defined as an area of not more than 0.1 m^{-2} which is at least 1.5 m from any other unprotected area in the same wall.

Northern Ireland

- for buildings one metre or more from a boundary, the system is acceptable
- for buildings less than one metre from a boundary, the system can be acceptable provided the wall meets the fire resistance requirements given in Tables 3.1 and 3.2, from both sides
- the system is acceptable, subject to the aforementioned conditions, for use on a building which has a storey the floor of which is up to 18 m above ground level.

6.3 The systems are restricted for use in buildings less than 18 m in height unless it is designed in accordance with the principles given in BRE report (BR 135 : 2003) *Fire Performance of External Insulation for Walls of Multi-storey buildings*.

6.4 In buildings not subject to the Building Regulations, it is recommended that designers should consider the guidance given in section 6.3.

6.5 An insulation system with a 60 mm thickness of Kingspan K16 phenolic insulation was tested[1][2] in accordance with BS 8414-1 : 2002. The system, as described in BRE test report number 230208, met the requirements of BRE report (BR 135 : 2003) *Fire Performance of External Insulation for Walls of multi-storey Buildings*, Annex A. This relates to the use of combustible materials and a requirement for fire barriers to limit the risk of fire spread between floors in buildings subject to the Building Regulations in England and Wales, Scotland and Northern Ireland. Further guidance is given in BRE report (BR 135 : 2003).

(1) The fire performance of other insulations and thicknesses should be confirmed by a fire expert from a United Kingdom Accreditation Service (UKAS) accredited fire test house.



6.6 Fire barriers or fire breaks should be incorporated into a construction where required by the relevant Building Regulations to maintain the continuity of fire resistance (see Figure 3). In addition any cavities present within the system, such as those formed between the external wall insulation system and the substrate, must have an appropriate fire stop or cavity barrier. This should be in accordance with the relevant clauses or sections of:

England and Wales — Approved Document B, Volume 1, Section 5 and 6, and Volume 2, Sections 8 and 9

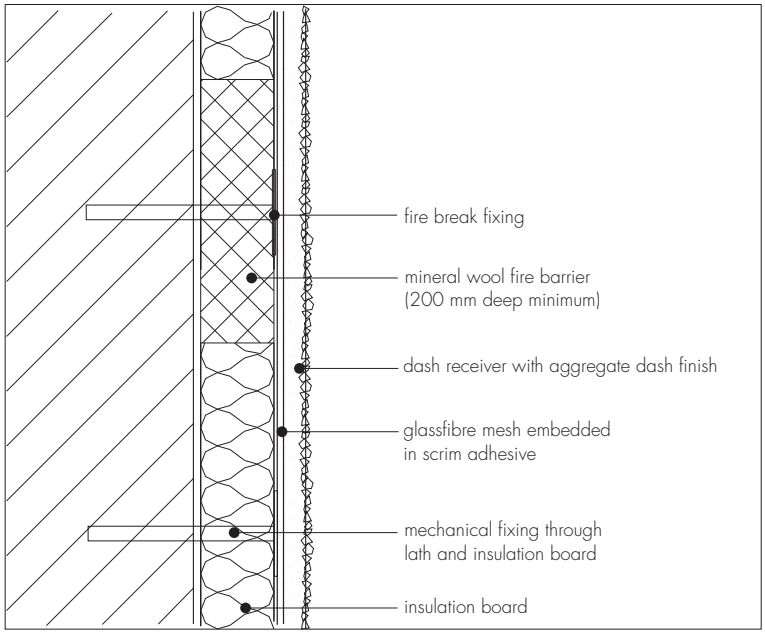
Scotland — Technical Standards 2.2, 2.4, 2.6 and 2.7, clauses 2.1.4[1][2], 2.4.2[1][2], 2.4.7[1], 2.4.9[2], 2.6.1[1][2] to 2.6.5[1][2], 2.6.6[2], 2.6.7[2], 2.7.1[1][2] and 2.7.2[2] respectively, and Annex 2.A[1]

Northern Ireland — Technical Booklet E, Section 3, paragraphs 3.35 to 3.39, and Section 4.

(1) Technical Handbook (Domestic).

(2) Technical Handbook (Non-Domestic).

Figure 3 Firebreak details



7 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]

Northern Ireland — Technical Booklet L.

(1) Technical Handbook (Domestic).

(2) Technical Handbook (Non-Domestic).

8 Rain penetration



8.1 Guidance given in BRE report (BR 262 : 2002) should be followed in that 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. Additional guidance can be found in:

England and Wales — Approved Document C, Section 5

Scotland — Mandatory Standard 3.10[1][2]

Northern Ireland — Technical Booklet C, Section 2.

(1) Technical Handbook (Domestic).

(2) Technical Handbook (Non-Domestic).

8.2 In all cases, care should be taken to ensure that walls are weathertight prior to application of the system. The system should only be installed where dampness (other than that caused solely by condensation) is not evident on the inner surface of the substrate.

8.3 Designers and installers should take particular care over detailing around openings and penetrations to minimise the risk of rain ingress.

8.4 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 (see section 15.20).

9 Condensation



9.1 When using the system, consideration must be given to the overall design to minimise the risk of condensation, and the recommendations of BS 5250 : 2002 should be followed.

9.2 Designers should ensure that an appropriate condensation risk analysis has been carried out for all parts of a construction, including at junctions between the insulation systems and windows, and at other openings and penetrations, to ensure condensation does not occur at the surface or within.

9.3 The water resistance factor (μ value) for the different insulation boards, as taken from BS EN 12524 : 2000, is given in Table 2.

Table 2 Insulation board — water vapour resistance factor

Insulant	μ value[1]
Expanded polystyrene	60
Mineral wool	1
Phenolic board[2]	50
PIR	60

(1) Values taken from BS EN ISO 10456 : 2007.

(2) The phenolic insulation is faced with glassfibre tissue; this increases the water vapour resistance factor.

9.4 Internal wet work, eg screeding or plastering, must be completed and allowed to dry prior to the application of the systems.

Surface condensation



9.5 Walls will adequately limit the risk of surface condensation when the thermal transmittance (U value) does not exceed 0.7 $W \cdot m^{-2} \cdot K^{-1}$ at any point, and the junctions with other elements and openings comply with section 10.5.



9.6 Walls and ceilings will adequately limit the risk of surface condensation when the thermal transmittance (U value) does not exceed 1.2 $W \cdot m^{-2} \cdot K^{-1}$ at any point. Guidance may be obtained from BS 5250 : 2002, Section 8, and BRE report (BR 262 : 2002).

Interstitial condensation



9.7 Weathertight walls incorporating the insulation systems will adequately limit the risk of interstitial condensation when designed and constructed in accordance with BS 5250 : 2002, Section 8 and Annex D.

9.8 If a 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 in the wall.

10 Thermal performance

10.1 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 ($\lambda_{90/90}$ *value)* given in Table 3.

Table 3 Thermal conductivity values

Insulation	Thickness (mm)	$\lambda_{90/90}$ *value* ($W \cdot m^{-1} \cdot K^{-1}$)
Expanded polystyrene	40 – 240	0.038
Mineral wool	30 – 240	0.037
Phenolic board	40 – 45 ≥ 45	0.021 0.020
PIR	20 – 90	0.027

10.2 The U value of a wall construction will depend on the selected insulation thickness, the fixing method and the insulating value of the substrate masonry and its internal finish. Example U values are given in Table 4.

Table 4 Thickness of insulation required to achieve typical design values(1)(2)

U value ($W \cdot m^{-2} \cdot K^{-1}$)	Thickness of insulation(3) (mm)			
	EPS	Mineral Wool	Phenolic	PIR
0.19	230	230	140	180
0.26	170	160	100	130
0.28	150	150	100	120
0.30	140	140	90	110

(1) Wall construction: 200 mm dense concrete block (λ = 1.75 $W \cdot m^{-1} \cdot K^{-1}$) with 12 mm dense plaster finish.

(2) Including eight steel fixings of 5.5 mm diameter per metre, λ_{steel} = 50 $W \cdot m^{-1} \cdot K^{-1}$ (assumes that the fixing penetrates the whole insulation layer).

(3) Based upon incremental insulation thickness of 10 mm.

10.3 When considering insulation requirements, designers should refer to the detailed guidance given in documents supporting the national Building Regulations.

10.4 The systems can maintain, or contribute to maintaining, continuity of thermal insulation at junctions between elements and openings. 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).

10.5 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.

11 Maintenance



11.1 Regular checks should be made on the installed insulation systems, particularly at joints with other elements, to ensure that ingress of water does not occur. This should verify that architectural details for shedding water clear of the building are present and functioning, and that external plumbing fitments are in good condition. Maintenance schedules should include the replacement and resealing of joints, for example between the insulation systems and window and door frames. The interval between inspections should be considered for each building allowing for such factors as the building location and height. Necessary repairs should be effected immediately and the sealant at joints at window and door frames replaced at regular intervals.

11.2 The designer should ensure suitable access is available to enable maintenance inspections to take place safely.

11.3 Damaged areas must be repaired using the appropriate components and the procedures detailed in the Certificate holder's technical literature. The Certificate holder should be consulted on the appropriate measures for a particular installation.

12 Durability



12.1 The results of accelerated ageing tests in accordance with MOAT No 22 : 1988 indicate that the system is durable. The system should remain effective for at least 30 years, provided any damage to the surface finish is repaired immediately, and regular maintenance is undertaken (see section 11). This includes checks on joints in the systems and on penetrations to enable corrective action to be taken to rectify the defects.

12.2 A spar dash finish will break up the flow of water on the surface and reduce the risk of discoloration by water runs. The finish may become discoloured with time. The rate at which this occurs will depend on the initial colour, the degree of exposure, the level of atmospheric pollution and the design and detailing of the wall. In common with traditional renders, discoloration by algae and lichens may occur in wet areas.

12.3 Render containing Portland cement may be subject to lime bloom. The occurrence of this may be reduced by avoiding applications in adverse weather conditions. The effect is less noticeable on lighter colours.

Installation

13 Site survey and preliminary work

13.1 Before application of the Epsicon 3 External Wall Insulation System, a pre-installation survey of the property is carried out to determine whether repairs are required to the substrate wall. A specification is prepared for each elevation of the building indicating, for example:

- the position of beads
- additional reinforcement at corners of openings
- detailing around windows, doors and at eaves
- dpc level
- exact position of expansion joints
- areas where flexible sealants are required
- any alterations to the external plumbing
- position of fire barriers.

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

13.3 A series of tests should be carried out to determine the resistance to pull-out of the proposed fixings (see section 5.8).

13.4 On existing buildings, purpose-made sills must be fitted to extend beyond the finished face of the system. New buildings should incorporate suitably deep sills.

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

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

13.7 In buildings of more than two storeys at least one fixing per insulation board should be of a non-combustible type to provide the increased stability that may be required in a fire see (section 15.11).

13.8 Where mechanical fixings are to be used to secure the system, trial tests should be conducted on the wall by the Certificate holder or their approved applicators (see section 14) to determine the pull-out resistance of the proposed mechanical fixings.

13.9 All modifications, such as provision for cavity barriers and fire stopping (see section 6) and necessary repairs to the building must be completed before installation commences.

13.10 It is recommended that external plumbing be removed before installation, and any necessary alterations made to underground drainage to accommodate repositioning of the plumbing on the finished face of the system.

13.11 New buildings should be of sound masonry or dense concrete construction.

14 Approved installers

Application of the systems, within the context of this Certificate, must be carried out by installers approved by the Certificate holder. A Certificate-holder approved installer is a company which:

- employs operatives who have been trained and approved by the Certificate holder to install the systems and who, upon completion of their training, have been issued with an appropriate identification card by the Certificate holder
- has undertaken to comply with the Certificate holder's application procedure, including the requirement for each installation team to include at least one member with an identification card
- agrees to be subject to supervision and site inspections by the Certificate holder.

15 Procedure

General

15.1 Installation of the system should be carried out in accordance with the Certificate holder's current installation instructions.

15.2 Application of coating materials must not be carried out at temperatures below 5°C or above 30°C, or if exposure to frost is likely, and the coating must be protected from rapid drying. Weather conditions, therefore, should be monitored to ensure correct curing conditions.

15.3 All rendering should be in accordance with the relevant recommendations of BS EN 13914-1 : 2005 and BS EN 13914-2 : 2005.

15.4 Before installation takes place, the building designer must confirm where items such as rainwater goods, satellite dishes, clothes lines and hanging baskets will be placed. The fixing points for these items must be specifically designated and built into the system as the insulation is installed. This is outside the scope of this Certificate.

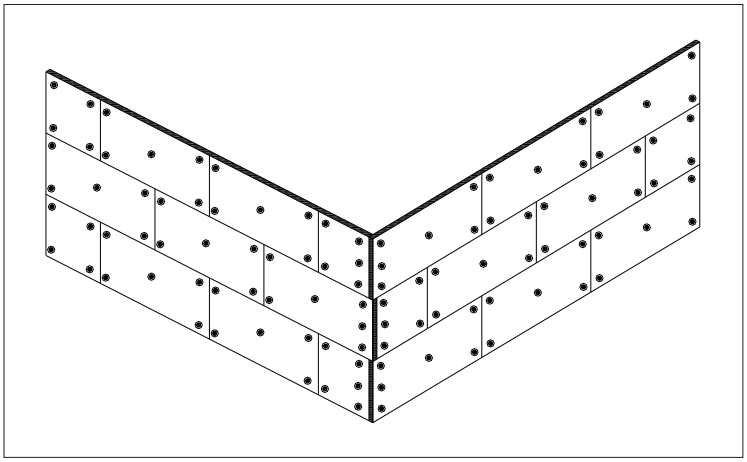
15.5 The base profile is secured to the external wall above the damp-proof course using mechanical fixings at a minimum of 300 mm centres.

Positioning and securing insulation boards

15.6 The base profile is secured to the external wall above the damp-proof course using the approved profile fixings at approximately 300 mm centres.

15.7 The first run of insulation boards is positioned on the base profile. Holes are drilled into the substrate to a minimum depth of 50 mm through the centre of each board. The mechanical fixings are inserted and tapped firmly into place, securing the insulation board to the substrate. Subsequent rows of boards are positioned so that the joints are staggered and overlapped at the building corners (see Figure 4).

Figure 4 Arrangement of insulation boards



15.8 Care must be taken to ensure that all board edges are butted tightly together, and alignment should be checked as work proceeds. For expanded polystyrene, high spots or irregularities should be removed by lightly planing with a rasp.

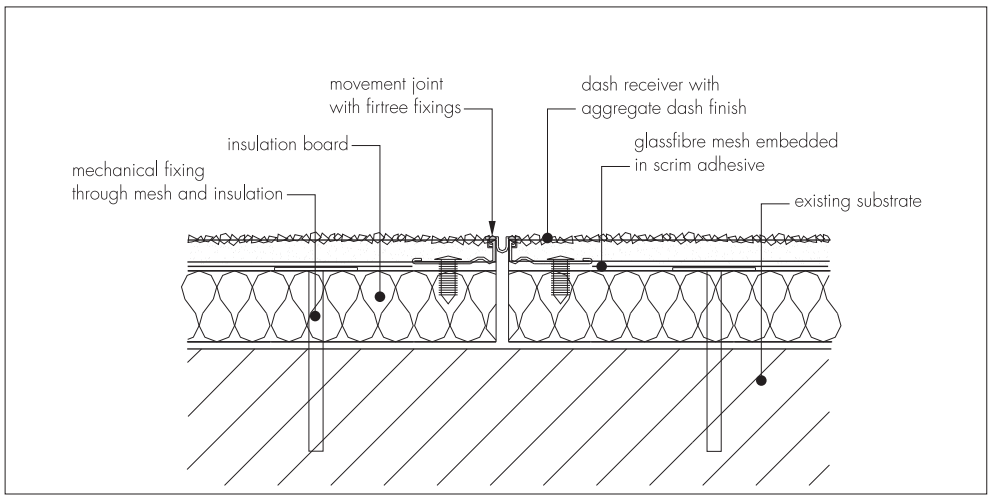
15.9 To fit around details such as doors and windows, insulation boards may be cut with a sharp knife or a fine-tooth saw. If required, purpose-made window-sills are fitted. They are designed to prevent water ingress and incorporate drips to shed water clear of the system.

15.10 Installation continues until the substrate is completely covered including, where appropriate, the building soffits.

Movement joints

15.11 Movement joints in the substrate must be continued through the system. The joint detail using purpose made metal trims is illustrated in Figure 5.

Figure 5 Vertical movement joint



15.12 Expansion beads are fixed vertically in agreed positions. These beads are positioned at approximately seven metre centres along a building, the centres depending on the individual requirements of each job.

Reinforcing

15.13 Holes are drilled at 300 mm vertical centres and 400 mm horizontal centres before the basecoat hardens and mechanical fixings are inserted through the mesh and tapped firmly home. A minimum of five fixings are used per board, see Figure 7.

15.14 Angle beads are fixed to all building corners and to door and window heads and jambs where required.

15.15 Stop beads are positioned vertically, eg at party wall positions where the adjoining house does not require treatment.

15.16 Prior to the render coat, a bead of clear silicone rubber mastic is gun applied at window and door frames, overhanging eaves, gas and electric meter boxes, wall vents or where the render abuts any other building material or surface.

15.17 In buildings of more than two storeys, from the third storey up, holes are drilled at 1 m centres for additional fixings before the basecoat hardens, and stainless steel fixings are inserted through the scrim, insulation and into the substrate wall.

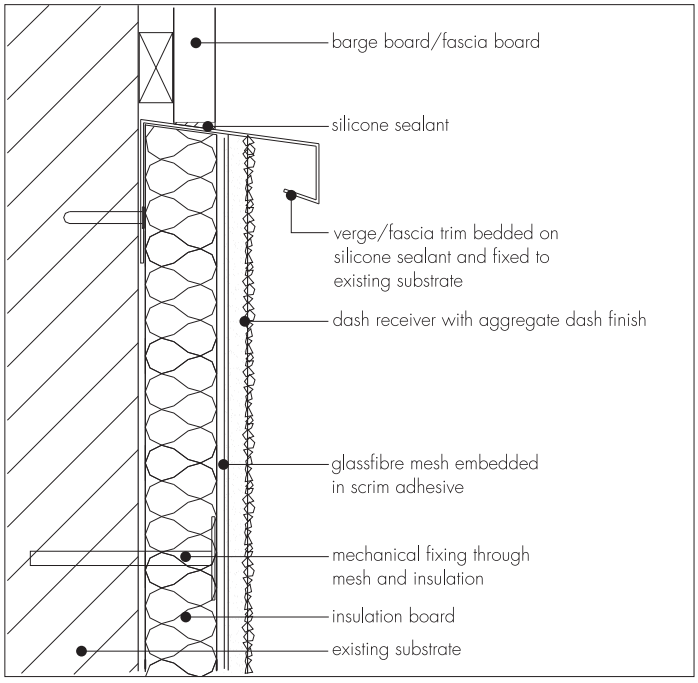
15.18 The basecoat and topcoat renders are prepared by mixing the contents of each 25 kg bag with approximately 7 to 8 litres of cold, clean water, using a paddle mixer. Mixing time should be at least five minutes after the addition of the last bag of render to allow an even dispersion of the resins.

15.19 The basecoat render is trowel applied to the surface of dry insulation boards to a minimum thickness of 4 to 6 mm. The mesh is bedded into the adhesive with 100 mm laps at joints. Additional reinforcement patches should be fitted at the corners of windows and doors and similar openings, see Figure 7.

15.20 The drying period of any render will depend on weather conditions; however, the basecoat must be left to harden for at least one day before application of the topcoat. The topcoat is prepared and trowel-applied to a thickness of approximately 8 mm to 10 mm. While the render is still soft, selected clean spar aggregate is thrown or sprayed onto the surface. On completion, the surface must be checked to ensure an even coverage of spardash has been achieved. Where necessary the aggregate should be lightly tamped to ensure that a good bond is achieved.

15.21 At the tops of walls the system should be protected by an adequate overhang or by an adequately sealed, purpose-made flashing (see Figure 6).

Figure 6 Roof eaves detail



15.22 Care should be taken in the detailing of the system around openings and projections (see Figures 7 to 10).

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

15.24 Continuous surfaces should be completed without a break.

Figure 7 Corner reinforcement and typical fixing pattern

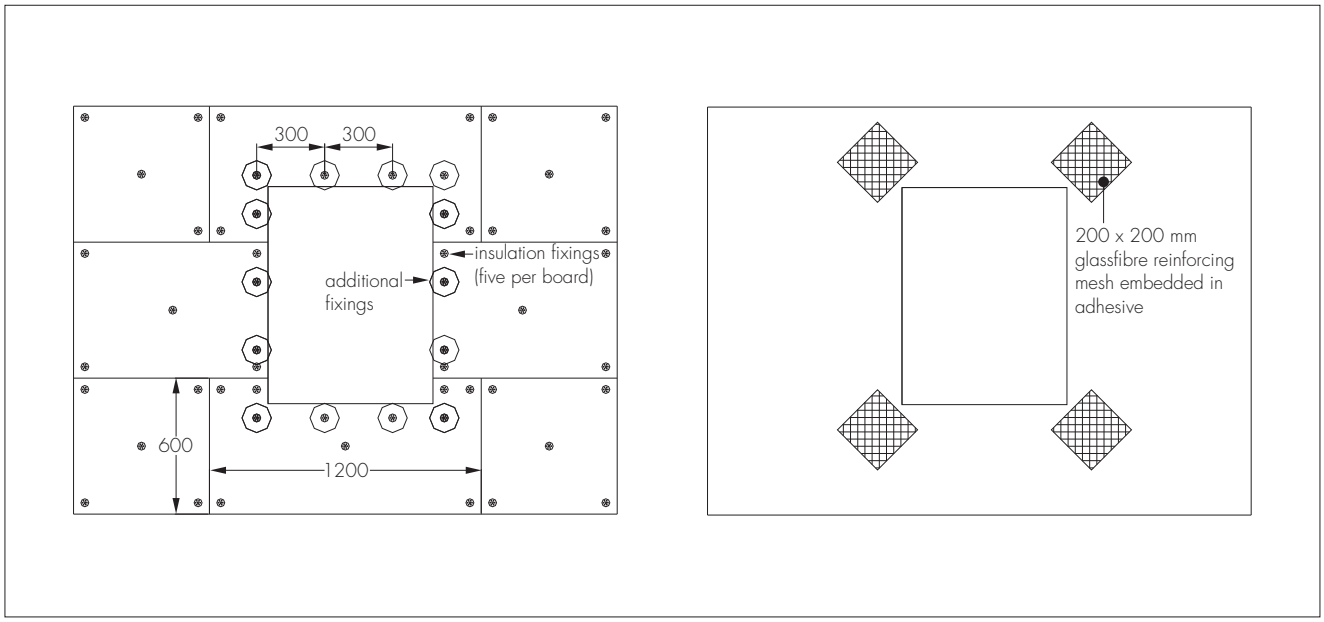


Figure 8 Insulated window reveal

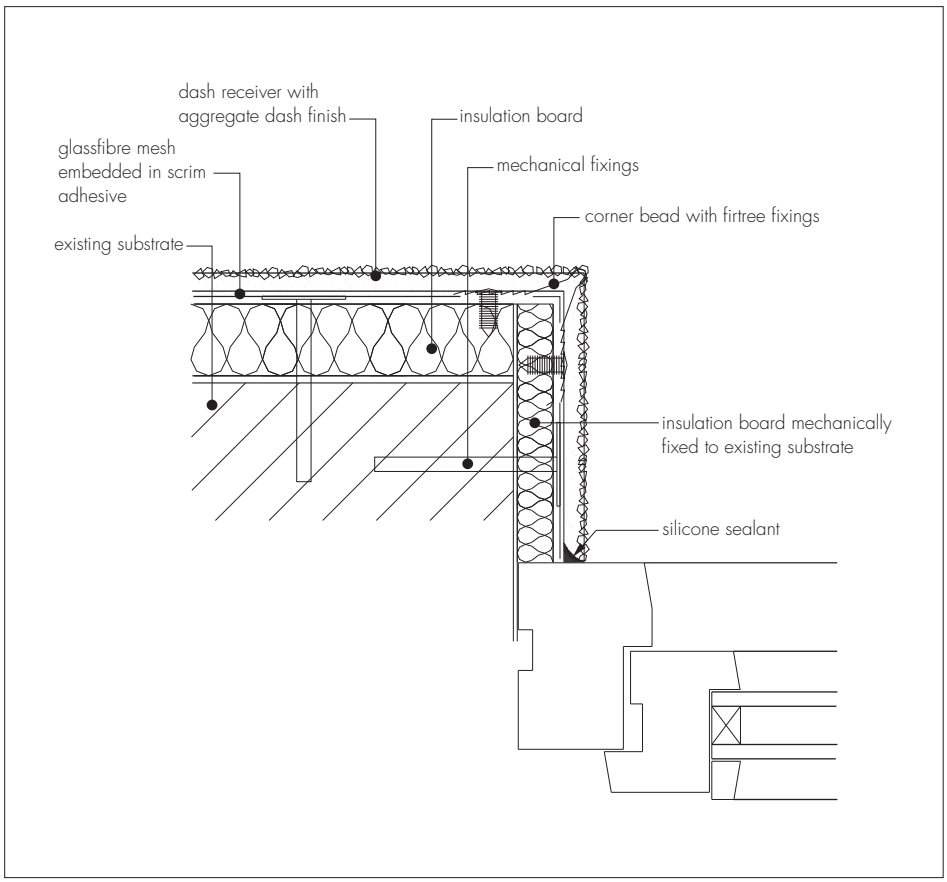


Figure 9 Window sill detail

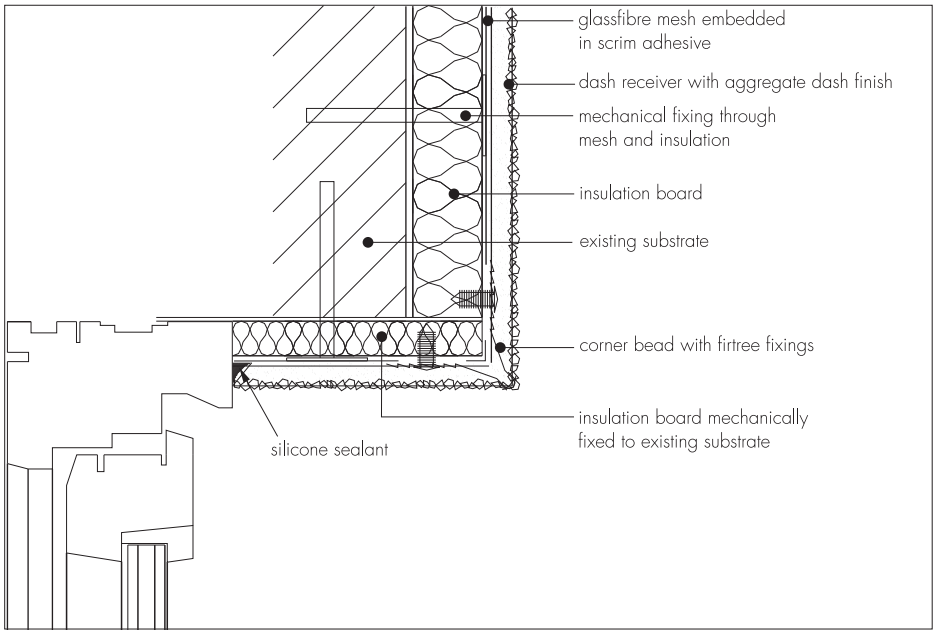
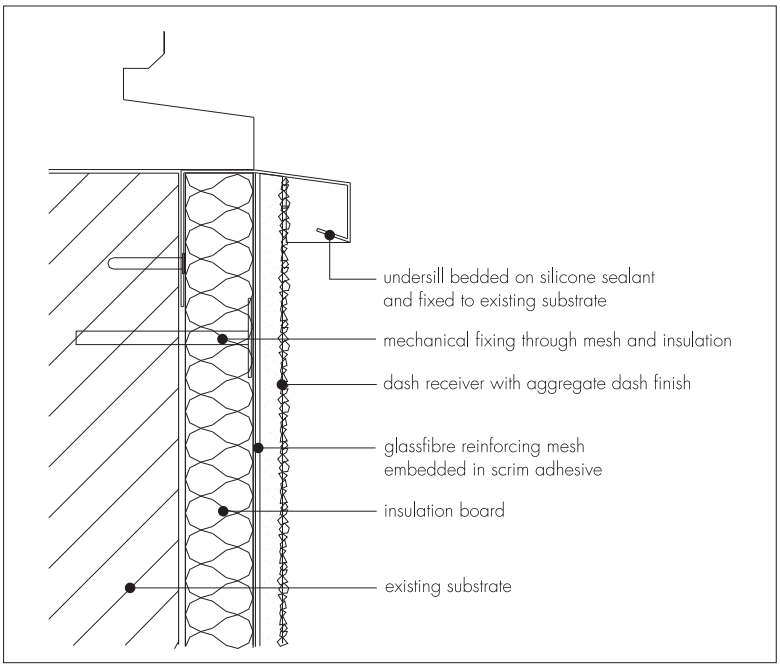


Figure 10 Window sill detail



Technical Investigations

16 Tests

16.1 Tests were carried out in accordance with MOAT No 22 : 1988 to determine:

- component characterisation
- heat spray cycling
- resistance to freeze/thaw
- impact resistance.

16.2 An examination was made of data relating to:

- water vapour permeability
- fire propagation tests to BS 476-6:1989
- surface spread of flame tests to BS 476-7:1987
- pull out strength of fixings
- durability of finish.

16.3 The practicability of installation and the effectiveness of typical details were examined.

17 Investigations

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

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18 Conditions

18.1 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.

18.2 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.

18.3 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.

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

18.5 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:

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- the right of the Certificate holder to manufacture, supply, install, maintain or market the product/system
- individual 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.

18.6 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.

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