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Agrément Certificate
14/5173
Product Sheet 1

LIME GREEN EXTERNAL WALL INSULATION SYSTEMS

WARMHELL WF/EPS EXTERNAL WALL INSULATION SYSTEM

This Agrément Certificate Product Sheet⁽¹⁾ relates to the Warmshell WF/EPS External Wall Insulation System, comprising wood-fibre (WF) or grey expanded polystyrene (EPS) insulation boards, mechanically-fixed with supplementary adhesive, with a reinforced basecoat and render finishes. It is suitable for use, with height restrictions, on the outside of external walls in new and existing domestic and non-domestic buildings.

(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 can contribute to satisfying the requirements of the national Building Regulations (see section 6).

Strength and stability — the system can adequately resist wind loads and impact damage. The impact resistance is dependent on the finish chosen (see section 7).

Behaviour in relation to fire — the system can have a B-s1, d0 reaction to fire classification in accordance with BS EN 13501-1 : 2007 and its use is restricted (see section 8).

Risk of condensation — the system can contribute to limiting the risk of interstitial and surface condensation (see section 11).

Durability — when installed and maintained in accordance with the Certificate holder's recommendations and the terms of this Certificate, the system will remain effective for 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: 23 December 2014

Brian Chamberlain

Brian Chamberlain
Head of Approvals — Engineering

Claire

Claire Curtis-Thomas
Chief Executive

Certificate amended on 8 December 2017 to reflect changes in sections 4 and 7.

Certificate amended on 5 May 2020 regarding the revised fire regulations, classification and associated text.

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 **MUST** check the validity and latest issue number of this Agrément Certificate by either referring to the BBA website or contacting the BBA directly.

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Regulations

In the opinion of the BBA, Warmshell WF/EPS External Wall Insulation System, if installed, used and maintained in accordance with this Certificate, can satisfy or contribute to satisfying 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 sections 7.1 to 7.12 of this Certificate.
Requirement:	B4(1)	External fire spread
Comment:		The system is restricted by this Requirement. See sections 8.1 to 8.5 of this Certificate.
Requirement:	C2(b)	Resistance to moisture
Comment:		The system can provide a degree of protection against rain ingress. See section 10.1 of this Certificate.
Requirement:	C2(c)	Resistance to moisture
Comment:		The system can contribute 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 can contribute to satisfying this Requirement. See sections 6.2 and 6.3 of this Certificate.
Regulation:	7(1)	Materials and workmanship
Comment:		The system is acceptable. See section 13.1 and the <i>Installation</i> part of this Certificate.
Regulation:	7(2)	Materials and workmanship
Comment:		The system is restricted by this Regulation. See sections 8.1 to 8.5 of this Certificate.
Regulation:	26	CO₂ emission rate for new buildings
Regulation:	26A	Fabric energy efficiency rates for new dwellings (applicable to England only)
Regulation:	26A	Primary energy consumption rates for new buildings (applicable to Wales only)
Regulation:	26B	Fabric performance values for new dwellings (applicable to Wales only)
Comment:		The system can contribute to satisfying these Regulations; however, compensating fabric and/or services measures may need to be taken. See sections 6.2 and 6.3 of this Certificate.



The Building (Scotland) Regulations 2004 (as amended)

Regulation:	8(1)(2)	Durability, workmanship and fitness of materials
Comment:		The system can contribute to a construction satisfying this Regulation. See sections 12 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. See sections 7.1 to 7.12 of this Certificate.
Standard:	2.6	Spread to neighbouring buildings
Comment:		The external face of the system is restricted 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 8.1 to 8.4, 8.6 and 8.7 of this Certificate.
Standard:	2.7	Spread on external walls
Comment:		The external face of the system is restricted with reference to clauses 2.7.1 ⁽¹⁾⁽²⁾ and 2.7.2 ⁽²⁾ and Annex 2A ⁽¹⁾ . See sections 8.1 to 8.4, 8.6 and 8.7 of this Certificate.
Standard:	3.10	Precipitation
Comment:		The system will contribute to a construction satisfying this Standard, with reference to clauses 3.10.1 ⁽¹⁾⁽²⁾ and 3.10.2 ⁽¹⁾⁽²⁾ . See section 10.1 of this Certificate.
Standard:	3.15	Condensation
Comment:		The system will satisfy the requirement 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:		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⁾ , 6.1.6 ⁽¹⁾ , 6.2.1 ⁽¹⁾⁽²⁾ , 6.2.3 ⁽¹⁾ , 6.2.4 ⁽²⁾ , 6.2.5 ⁽²⁾ , 6.2.6 ⁽¹⁾ , 6.2.7 ⁽¹⁾ , 6.2.8 ⁽²⁾ , 6.2.9 ⁽¹⁾⁽²⁾ , 6.2.10 ⁽¹⁾ , 6.2.11 ⁽¹⁾ , 6.2.12 ⁽²⁾ and 6.2.13 ⁽¹⁾⁽²⁾ . See sections 6.2 and 6.3 of this Certificate.
Standard:	7.1(a)(b)	Statement of sustainability
Comment:		The system can contribute to satisfying the relevant requirements of Regulation 9, Standards 1 to 6, and therefore will contribute to a construction meeting a bronze level of sustainability as defined in this Standard. In addition, the system 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 6.2 and 6.3 of this Certificate.

(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(b)	Resistance to ground moisture and weather
Comment:		The system can provide a degree of protection against rain ingress. See section 10.1 of this Certificate.
Regulation:	29	Condensation
Comment:		The system can contribute to minimising the risk of interstitial and surface condensation. See section 11.4 of this Certificate.
Regulation:	30	Stability
Comment:		The system can sustain and transmit wind loads to the substrate wall. See sections 7.1 to 7.12 of this Certificate.
Regulation:	36(a)	External fire spread
Comment:		The system is restricted by this Regulation. See sections 8.1 to 8.5 of this Certificate.
Regulation:	39(a)(i)	Conservation measures
Regulation:	40(2)	Target carbon dioxide emissions rate
Comment:		The system can contribute to satisfying these Regulations. See sections 6.2 and 6.3 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 sections: 3 *Delivery and site handling* (3.2 and 3.4) of this Certificate.

Additional Information

NHBC Standards 2014

NHBC accepts the use of Warmshell WF/EPS External Wall Insulation System, provided it is installed, used and maintained in accordance with this Certificate in relation to *NHBC Standards, Part 6 Superstructure (excluding roofs)*, Chapter 6.9 *Curtain walling and cladding*.

Technical Specification

1 Description

1.1 The Warmshell WF/EPS External Wall Insulation System, comprising wood-fibre (WF) or grey expanded polystyrene (EPS) insulation boards, mechanically-fixed with supplementary adhesive, with a reinforced basecoat and render finishes (see Figure 1).

1.2 The insulation boards are fixed to the external surface of the wall using mechanical fixings and supplementary adhesive. When all boards have been secured to the wall and rasped, basecoat is applied to their surface the required thickness, with the reinforcing mesh being immediately embedded. The surface is smoothed with a trowel, working from the centre towards the edges, before another layer of basecoat is applied. When dry, the surface is ready for the application of the selected finish.

1.3 The system comprises the following components:

Supplementary adhesive

- Lime Green Prebond WP — lime-based powder requiring 3.75 litres of clean water per 18 kg bag.

Insulation

- Wood-fibre base board — 1325 mm x 600 mm in a range of thicknesses from 40 mm to 240 mm, with a nominal density of 250 kg·m⁻³, minimum compressive strength of 100 kN·m⁻² and tensile strength perpendicular to the faces of 15 kPa. Boards are manufactured to comply with the requirements of BS EN 13171 : 2012
- Graphite expanded polystyrene (EPS 100) Board — 1200 mm by 600 mm in a range of thicknesses from 30⁽¹⁾ mm to 300 mm, with a nominal density of 18 kg·m⁻³, minimum compressive strength of 100 kN·m⁻² and minimum tensile strength perpendicular to the faces of 88 kPa. Boards are manufactured to comply with the requirements of BS EN 13163 : 2012
- Graphite expanded polystyrene (EPS 70) Board — 1200 mm by 600 mm in a range of thicknesses from 30⁽¹⁾ mm to 300 mm, with a nominal density of 16 kg·m⁻³, minimum compressive strength of 70 kN·m⁻² and minimum tensile strength perpendicular to the faces of 100 kPa. Boards are manufactured to comply with the requirements of BS EN 13163 : 2012.

(1) insulation thickness lower than 80 mm should be used around openings or reveals.

Mechanical fixings⁽¹⁾

- WKTherm — polyethylene anchor sleeve, with a galvanized steel hammer-in pin with polyamide-coated fixing head
- WKTherm S — polyethylene anchor sleeve, with a galvanized steel screw-in fixing with plastic fixing head.

(1) Other fixings may be used provided they can be demonstrated to have equal or higher pull-out and plate stiffness characteristics.

Basecoat

- Lime Green Prebond WP — lime-based powder requiring 4.5 litres of clean water per 18 kg bag, applied in two layers to an overall thickness of 10 mm.

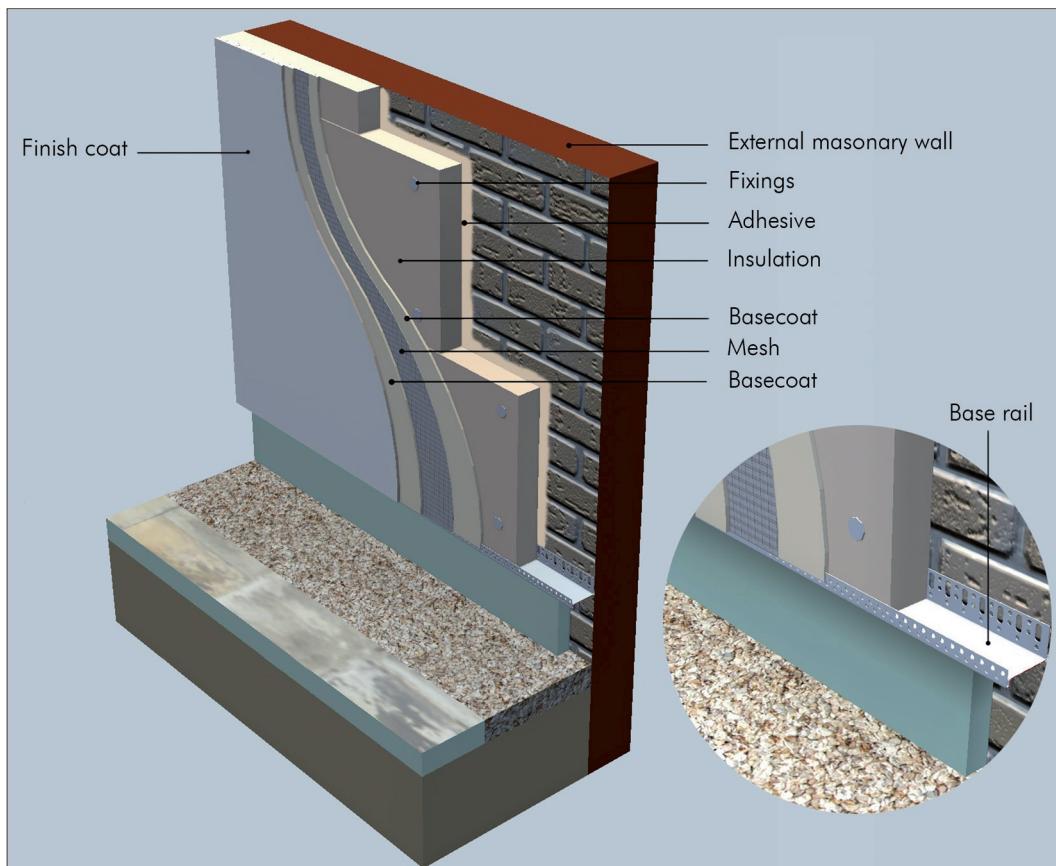
Reinforcement

- Lime Green Fibre Mesh 660 — 1 m wide by 50 m long (6 mm by 6 mm mesh size) of multi-strength glassfibre with a polymer coating and nominal weight of 146 g·m⁻².

Finishing coats

- Lime Green Finish WP — powder-based finishing coat requiring the addition of 4.5 to 5.5 litres of clean water per 22 kg bag. Applied to a thickness of 5 mm to 7 mm
- Lime Green Silicate Mineral Finish — ready-mixed silicate mineral finishing coat in 0.5 mm and 2 mm ('coarse') particle sizes, and additional smooth fine coat, both of which to be used.

Figure 1 Lime Green WF/EPS External Wall Insulation System



1.4 Ancillary components used with the system, but outside the scope of this Certificate:

- Range of aluminium, PVC-U or stainless steel profiles, comprising:
 - base profile
 - edge profile
 - corner profile
 - render stop profile
 - expansion joint
- profile connectors and fixings
- fungicidal wash, sealants and sealers
- foam — fire-rated polyurethane foam (used with EPS boards).

2 Manufacture

2.1 Components are manufactured by the Certificate holder or bought-in from suppliers, to an agreed specification.

2.2 As part of the assessment and ongoing surveillance of product quality, 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 in polythene-lined paper packs which carry the manufacturer's and product identification marks and batch numbers.

3.2 The other components are delivered in the quantities and packaging listed in Table 1. Each package carries the product identification and manufacturer's batch number.

Table 1 Component supply details

Components	Quantity/packaging
Lime Green Prebond W/P (supplementary adhesive)	18 kg bag
Lime Green Prebond W/P (basecoat)	18 kg bag
Lime Green Fibre Mesh 660	1 m wide x 50 m long
Lime Green Finish W/P	22 kg bag
Lime Green Silicate Mineral Finish	12.5 litre tub
Mechanical fixings	boxed by manufacturer

3.3 The boards must be stored on a firm, clean, level base, off the ground and under cover until required for use. Care must be taken when handling to avoid damage.

3.4 The boards must be protected from prolonged exposure to sunlight, either by storing opened packs under cover or re-covering with opaque polythene sheeting. Care must be taken to avoid contact with solvents or materials containing volatile organic components. The boards must not be exposed to open flame or other ignition sources.

3.5 The powder and paste components must be stored in a safe area, in dry conditions, off the ground and protected from excessive heat, moisture and frost. Contaminated materials should be discarded.

Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on the Warmshell External Wall Insulation Systems.

Design Considerations

4 General

4.1 The Warmshell WF/EPS External Wall Insulation System, when installed in accordance with this Certificate, is satisfactory for use in reducing the thermal transmittance (U value) of external masonry or concrete walls of 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 treatment with the system (eg the insulation must be protected by an overhang, and window sills should be designed and installed so as to direct water away from the building).

4.2 For improved thermal/carbon-emissions performance of the structure, the designer should consider additional/alternative fabric and/or services measures.

4.3 The system is for application to the outside of external walls of masonry, normal weight concrete, lightweight concrete, autoclaved concrete and no-fines concrete construction, on new or existing domestic and non-domestic buildings (with or without existing render) with height restrictions (see section 8). Prior to the installation of the system, wall surfaces should comply with section 14 of this Certificate.

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

- BS EN 1992-1-1 : 2004 and its UK National Annex
- BS EN 1996-1-1 : 2005 and its UK National Annex
- BS EN 1996-2 : 2006 and its UK National Annex
- BS 8000-2.2 : 1990
- BS 8000-0 : 2014
- BS 8000-3 : 2001.

4.5 New walls not subject to regulatory requirements should also be built in accordance with the Standards identified in section 4.4 of this Certificate.

4.6 Movement joints should be incorporated into the system in line with existing movement joints in the building structure and in accordance with the Certificate holder's recommendations for the specific installation.

4.7 The system will improve the weather resistance of a wall and provide a decorative finish. However, for existing buildings, it should only be installed where there are no signs of dampness on the inner surface of the wall other than those caused solely by condensation.

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

4.9 The fixing of sanitary pipework, plumbing, rainwater goods, satellite dishes, clothes lines, hanging baskets and similar items to the system is outside the scope of this Certificate. See section 4.10 of this Certificate.

4.10 External pipework and ducts should be removed before installation, and alterations made to underground drainage to accommodate repositioning of the pipework to the finished face of the system. The Certificate holder may advise on suitable fixing methods, but these are outside the scope of this Certificate.

4.11 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.

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

5 Practicability of installation

The system should only be installed by specialised contractors who have successfully undergone training and registration by the Certificate holder (see section 14).

Note: The BBA operates a UKAS Accredited Approved Installer Scheme for external wall insulation; details of approved installer companies 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 using the declared thermal conductivity (λ_D value) of the insulation as given in Table 2.

Table 2 Thermal conductivity of the insulation

Insulation types	Thickness (mm)	Thermal conductivity ($W \cdot m^{-1} \cdot K^{-1}$)
Grey EPS 70	30 to 300	0.032
Grey EPS 100	30 to 300	0.032
Wood-fibre	40 to 240	0.044



6.2 The U value of a completed wall will depend on the selected insulation thickness, the fixing method and number of fixings, and the insulating value of the substrate masonry and its internal finish. Calculated U values for example constructions are given in Table 3.

Table 3 Insulation thickness required to achieve U value⁽¹⁾⁽²⁾⁽³⁾

U value ⁽⁴⁾ ($W \cdot m^{-2} \cdot K^{-1}$)	Thickness of insulation (mm)			
	215 mm brickwork $\lambda = 0.56 W \cdot m^{-1} \cdot K^{-1}$		200 mm dense blockwork $\lambda = 1.75 W \cdot m^{-1} \cdot K^{-1}$	
	WF	Grey EPS 70/100	WF	Grey EPS 70/100
0.18	240	170	— ⁽⁵⁾	180
0.19	220	160	230	170
0.25	160	120	170	130
0.26	150	110	160	120
0.28	140	100	150	110
0.30	130	100	140	100
0.35	110	80	120	90

(1) Wall construction inclusive of 13 mm plaster ($\lambda = 0.57 W \cdot m^{-1} \cdot K^{-1}$). Brickwork (protected) with 17.1% mortar, or dense blockwork with 6.7% mortar ($\lambda = 0.88 W \cdot m^{-1} \cdot K^{-1}$). Declared thermal conductivity of insulation values (λ_D) is as shown in Table 2. A 5 mm adhesive layer ($\lambda = 0.43 W \cdot m^{-1} \cdot K^{-1}$) covering 100% of the area is also included, together with an external render thickness of 5 mm ($\lambda = 1 W \cdot m^{-1} \cdot K^{-1}$).

(2) Calculations based on a mechanical system that included 7 galvanized steel fixings per square metre with a point thermal transmittance (χ_p) of $0.002 W \cdot K^{-1}$ per pin. Use of other types of fixings should be calculated in accordance with BS EN ISO 6946 : 2007.

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


(4) When applying the maximum available insulation thickness, these walls can achieve U values from $0.11 W \cdot m^{-2} \cdot K^{-1}$ to $0.19 W \cdot m^{-2} \cdot K^{-1}$ depending on insulation type and wall type.

(5) See section 4.2 of this Certificate.

6.3 The system can maintain, or contribute to maintaining, continuity of thermal insulation at junctions between external walls and other elements. Details shown in section 16 will allow use of the default ψ -values (Psi) for Accredited Construction Details in Emission Rate calculations to SAP 2009 or the Simplified Building Energy Model (SBEM). Detailed guidance can be found in the documents supporting the national Building Regulations.

7 Strength and stability

General

 7.1 The Certificate holder is ultimately responsible for the design of the system and it is the responsibility of the company installing the system to accurately follow the installation instructions (see also section 5 of this Certificate). The Certificate holder must also verify that a suitably experienced and qualified individual (with adequate professional indemnity) establishes that:

- the wind loads on the different zones of the building's elevation for the specific geographical location have been calculated correctly (see section 7.3)
- the system can adequately resist and safely transfer the calculated loads, accounting for all possible failure modes, to the substrate wall and supporting structure (see sections 7.3 to 7.6).

7.2 The substrate and supporting structure must be capable of transferring all additional loading due to the installation of the system to the ground in a satisfactory manner. The adequacy of the substrate and supporting structure must be verified by the person or party responsible for the global stability of the building to which the system is applied. Any defects should be made good prior to the system being installed.

7.3 The wind loads on the walls should be calculated, taking into account all relevant factors such as location and topography, in accordance with BS EN 1991-1-4 : 2005 and its UK National Annex. All of the factors affecting wind load on each elevation and specific zones of the building must be considered. In accordance with BS EN 1990 : 2002 and its UK National Annex, a partial factor of 1.5 must be applied to the calculated characteristic wind pressure values to establish the design wind load to be resisted by the system.

7.4 Installations correctly designed in accordance with this Certificate will safely accommodate the applied loads due to self-weight, wind and impact.

7.5 Positive wind load is transferred to the substrate wall directly via compression through the render and insulation system.

7.6 Negative wind load is transferred to the substrate wall via⁽¹⁾⁽²⁾:

- the bond between the insulation and render system (see section 7.7)
- the pull-out resistance of the fixing from the substrate wall (see section 7.8)
- the pull-through resistance of the fixing (see section 7.9).

(1) For mechanically fixed systems with supplementary adhesive, the contribution of the adhesive is not considered when calculating resistance to wind load.

(2) Further guidance is available from BBA Guidance Note 1, available on the BBA website (www.bbacerts.co.uk).

7.7 The characteristic bond resistance between the insulation and render interface derived from test results was 80 kN·m⁻² for the EPS board and 60 kN·m⁻² for the wood-fibre board. The design resistance of the bond between the insulation and render (N_{RD1}) should be taken as the characteristic bond resistance divided by a partial factor of 9.

7.8 Typical characteristic pull-out resistances for the fixings taken from the corresponding European Technical Assessment (ETA) are given in Table 4; the values are dependent on the fixing type and must be selected to suit the specific loads and substrate concerned. In situations where suitable data does not exist⁽¹⁾, the characteristic pull-out resistance must be established from site-specific pull-out tests conducted on the substrate of the building to ascertain the minimum resistance to pull-out failure of the fixings, and determined in accordance with the guidance given in EOTA TR051 (minimum test characteristic value = 0.6 x mean of 5 lowest test results). To obtain the design pull-out resistance of the fixings (N_{RD2}), this characteristic pull-out resistance should then be divided by the partial factor given in Table 4.

(1) To qualify as suitable data, the age and condition of the substrate must be equivalent to that used to establish the values in the ETA.

Table 4 Fixings — typical characteristic pull-out resistances

Fixing type ⁽¹⁾	ETA number	Substrate	Drill diameter (mm)	Effective anchorage depth (mm)	Characteristic pull-out resistance (kN) ⁽²⁾	Partial safety factor
WK Therm	11/0232	Concrete C12/15 Clay brickwork	8	25	1.2 1.5	2
WK Therm S	13/0724	Concrete C12/15 Clay brickwork	8	25	1.2 1.5	2

(1) The minimum values for plate stiffness of fixings is 0.6 kN·mm⁻² and the load resistance is 4.3 kN.

(2) Values are determined in accordance with EAD 330196-00-0604 : 2016 and are dependent on the substrate. The Use Categories are defined in the corresponding ETA.

7.9 The characteristic pull-through resistance of the fixings was determined from tests using a 60 mm diameter fixing plate and minimum insulation thickness of 40 mm. The design resistance per fixing (N_{RD3}) is obtained by applying an appropriate partial factor as shown in Table 5.

Table 5 Design pull-through resistances

Factor (unit)	Pull-Through			
	Grey EPS Insulation 1200 mm x 600 mm		Wood-Fibre Insulation 1325 mm x 615 mm	
Tensile resistance of the insulation ($\text{kN}\cdot\text{m}^{-2}$)	≥ 100		≥ 30	
Fixing type ⁽¹⁾	Ejot STR		WK Therm S	
Fixing plate diameter (mm)	60		60	
Insulation thickness (mm)	≥ 40	≥ 100	≥ 40	≥ 100
Characteristic pull-through resistance ⁽²⁾ per fixing kN (at panels only)	0.335	1.515	0.782	1.506
Partial factor ⁽³⁾	2.5			
Design pull-through resistance per fixing (N_{RD3}) kN (at panels only)	0.134	0.606	0.313	0.602
Design pull-through resistance per board kN (based on minimum number of fixings) ⁽⁴⁾	0.670	3.030	1.565	3.012
Design pull-through resistance per board kN (based on maximum number of fixings) ⁽⁵⁾	1.608	7.272	3.756	7.229

(1) See Table 4 for typical characteristic pull-out resistance of the fixings.

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

(3) The partial factor is based on the assumption that all insulation boards are quality controlled and tested to establish tensile strength perpendicular to the face of the board.

(4) The minimum design pull through resistance per board is based on a minimum of 5 fixings per board (1200 mm x 600 mm and 1325 mm x 615 mm), which equates to approximately 7 fixings per m^2 . The design resistance for the minimum number of fixings is based on the fixing pattern provided in Figure 5 of this Certificate and minimum insulation thickness specified in Table 5. The fixing pattern and interaction of the fixings should be considered when calculating the design resistance per board.

(5) The maximum design pull through resistance per board is based on a maximum of 12 fixings per board (1200 mm x 600 mm and 1325 mm x 615 mm), which equates to approximately 16 fixings per m^2 . The design resistance for the maximum number of fixings is only applicable to the minimum insulation thickness tested and as specified in Table 5. The fixing pattern, insulation thickness and interaction of the fixings should be considered when calculating the design resistance per board.

7.10 The number and spacing of the fixings should be determined by the Certificate holder. The number of fixings must not be less than the minimum specified for the system and should be symmetrically positioned and evenly distributed both vertically and horizontally, except at openings and building corners.

7.11 The data obtained from sections 7.7, 7.8 and 7.9 must be assessed against the design wind load and the following expression must be satisfied:

For safe design:

$$R_d \geq W_e$$

$$R_{d_{b.ins/render}} = A_r * N_{RD1}$$

$$R_{d_{pull-out}} = n * N_{RD2}$$

$$R_{d_{pullthrough}} = (N_{RD3panel} * n_{panel}) + (N_{RD3joint} * n_{joint}) / A_{board}$$

Where:

R_d is the design ultimate resistance ($\text{kN}\cdot\text{m}^{-2}$) taken as the minimum of $R_{d_{b.ins/render}}$, $R_{d_{pull-out}}$ and $R_{d_{pullthrough}}$

W_e is the applied ultimate wind load ($\text{kN}\cdot\text{m}^{-2}$)

$R_{d_{b.ins/render}}$ is the design bond resistance between the insulation and render ($\text{kN}\cdot\text{m}^{-2}$)

$R_{d_{pull-out}}$ is the design pull-out resistance of the insulation fixings per metre square ($\text{kN}\cdot\text{m}^{-2}$)

$R_{d_{pullthrough}}$ is the design pullthrough resistance of the insulation fixings per metre square ($\text{kN}\cdot\text{m}^{-2}$)

A_r is the reinforced basecoat bond area (based on % area covered)

N_{RD1} is the design adhesive bond resistance between the insulation and render, based on test ($\text{kN}\cdot\text{m}^{-2}$)

n is the number of anchor fixings per m^2

N_{RD2} is the design pull-out resistance per fixing based on test (kN)

$N_{RD3panel}$ is the design pullthrough resistance per anchor not placed at the panel joint, based on test (kN)

$N_{RD3joint}$ is the design pullthrough resistance per anchor placed at the panel joint, based on test (kN)

n_{panel} is the number of internal anchors in a panel

n_{joint} is the number of joint anchors in a panel

A_{board} is the area of the board (m^2).

7.12 The insulation system is mechanically fixed to the substrate wall with a minimum of five fixings per board or approximately seven fixings per square metre, as per the fixing patterns shown in Figure 5, and in conjunction with a minimum 40% coverage of supplementary adhesive (see section 16 of this Certificate). Additional fixings may be required, depending on the results of the calculations detailed above for the specific site.

Impact resistance

7.13 Hard body impact tests were carried out in accordance with ETAG 004 : 2013. The system is suitable for use in the Categories I and II⁽¹⁾.

(1) The Use Categories are defined in ETAG 004 : 2013 as:

- 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
- 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
- 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 reaction to fire classification⁽¹⁾ of the system in Lime Green Silicate Mineral Finish, is B-s1, d0 in accordance with BS EN 13501-1 : 2007.

(1) EXOVA WARRINGTON. WF 332289 and WF 332290.

8.2 This fire classification applies to both insulation types and the full range of thicknesses. The classification of other colours of this system should be confirmed by reference to the documents supporting the national Building Regulations.

8.3 The Certificate holder has not declared a reaction to fire classification for the Lime Green Finish WP.

8.4 The Insulations in isolation are not classified as non-combustible or of limited combustibility.



8.5 In England, Wales and Northern Ireland, the systems are restricted for use in buildings up to 18 m in height and 1 m or more from a boundary. The systems defined in section 8.1 of this Certificate may be used on buildings at any proximity to a boundary.



8.6 In Scotland, the systems are not classified as non-combustible and may be used on buildings more than 1 m from a boundary and, on houses, 1 m or less from a boundary. With minor exceptions, the systems should be included in calculations of unprotected area, except on houses where the external wall behind has the appropriate fire resistance.

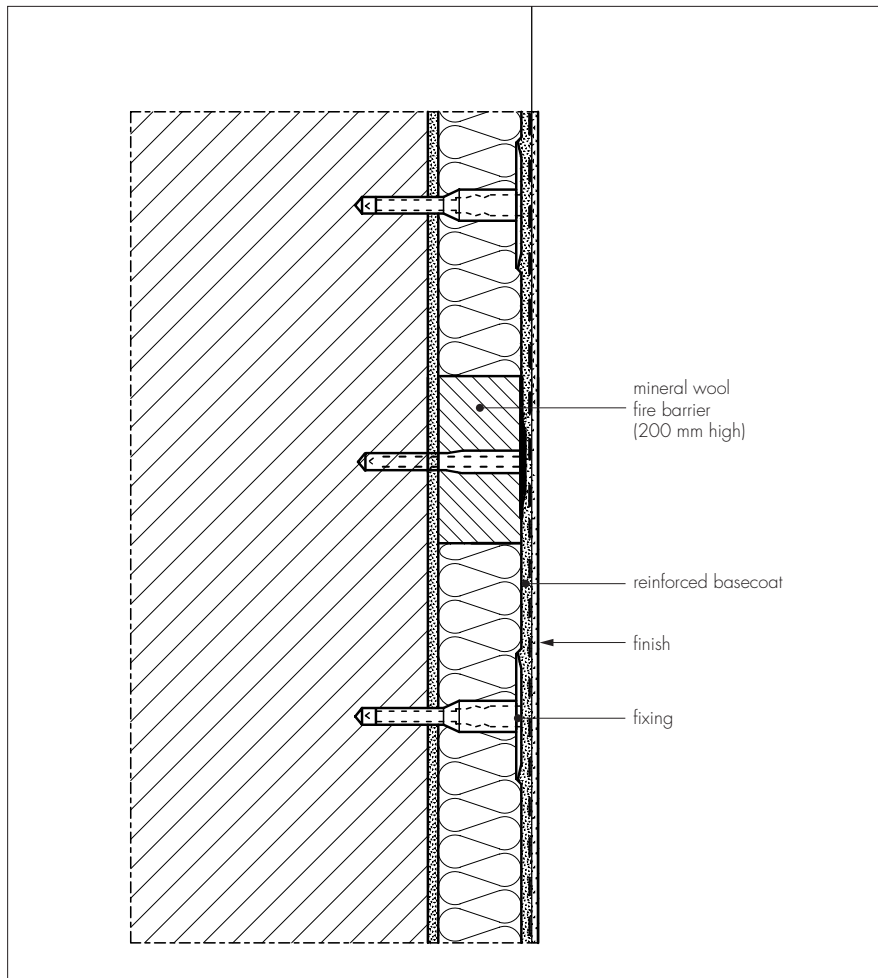
8.7 In Scotland, the systems should not be used on any building with a storey more than 11 m above the ground. or on any entertainment or assembly building with a total storey area more than 500 m², or on any hospital or residential care building with a total storey area more than 200 m².

8.8 For application to second storey walls and above, it is recommended that the designer considers at least one stainless steel fixing per square metre and fire barriers in line with compartment walls and floors as advised in BRE Report BR 135 : 2013 (see Figure 2 of this Certificate).

8.9 NHBC Standards require in all cases that a minimum of one non-combustible fixing through the reinforcement mesh, per square metre or per insulation board, whichever provides the greater number, should be provided, in addition to the other fixings.

8.10 Designers should refer to the relevant national Building Regulations and guidance for detailed conditions of use, particularly in respect of requirements for substrate fire performance, cavity barriers, service penetrations and combustibility limitations for other materials and components used in the overall wall construction.

Figure 2 Fire barrier details



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 Water resistance



10.1 The system will provide a degree of the protection against rain ingress. Care should be taken to ensure that walls are adequately weathertight prior to application of the system. The insulation system must 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.

10.3 Guidance given in BRE Report 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.

10.4 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 16).

11 Risk of condensation



11.1 Designers must ensure that an appropriate condensation risk analysis has been carried out for all parts of the construction, including openings and junctions, to minimise the risk of condensation. The recommendations given in 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 and openings comply with section 6.3 of this Certificate.



11.3 Walls will limit the risk of surface condensation adequately when the thermal transmittance (U value) does not exceed $1.2 \text{ W}\cdot\text{m}^{-2}\cdot\text{K}^{-1}$ at any point and detailing is in accordance with BS 5250 : 2011. Additional guidance may be obtained from BRE Report 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 water vapour resistance factor (μ) for the insulation boards and equivalent air layer thickness (S_d) for the render systems is shown in Table 6:

Table 6 Water vapour resistance factor (μ) and equivalent air layer thickness (S_d)

	Thickness range (mm)	S_d (m)	μ
Expanded polystyrene insulation (grey)	30 to 300	–	20 to 40 ⁽²⁾ (EPS 70) 30 to 70 (EPS 100)
Wood-fibre insulation	40 to 240	–	5
Lime Green Prebond WP (basecoat) + WP Finish	15 to 22	0.24 ⁽¹⁾	–
Lime Green Prebond WP (basecoat) + Silicate Mineral Finish	15.5 to 12	0.20 ⁽¹⁾	–

(1) The values are obtained from tests on a system that included basecoat, mesh, primer and finish coat.

(2) The water vapour resistance factors (μ values) are taken from BS EN 13163 : 2012, Table F.2. It is recommended that the lower figure is used when assessing the interstitial condensation risk.

12 Maintenance



12.1 Regular checks should be made on the installed system, including:

- visual inspection of the render for signs of damage. Cracks in the render exceeding 0.2 mm must be repaired
- examination of the sealant around openings and service entry points
- visual inspection of architectural details designed to shed water to confirm that they are performing properly
- visual inspection to ensure that water is not leaking from external downpipes or gutters; such leakage could penetrate the rendering
- necessary repairs effected immediately and the sealant joints at window and door frames replaced at regular intervals
- maintenance schedules, which should include the replacement and resealing of joints, for example between the insulation systems and window and door frame.

12.2 Damaged areas must be repaired using the appropriate components and procedures detailed in the Certificate holder's installation instructions and in accordance with BS EN 13914-1 : 2005.

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 of this Certificate.

13.2 Any render containing lime may be subject to lime bloom. The occurrence of this may be reduced by avoiding application in adverse weather conditions. The effect is transient and is less noticeable on lighter colours.

13.3 The render may become discoloured with time, the rate depending on the initial colour, 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.

13.4 To maintain a high quality aesthetic appearance, it may be necessary to periodically overcoat the building using a suitable masonry coating (ie one covered by a valid BBA Certificate for this purpose). Care should be taken not to adversely affect the water vapour transmission or fire characteristics of the system. The advice of the Certificate holder should be sought as to the suitability of a particular product.

14 Site survey and preliminary work

14.1 A pre-installation survey of the property must be carried out to determine suitability for treatment and any repairs necessary to the building structure before application of a system. A specification is prepared for each elevation of 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 installers 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 and pull-out resistance (see section 7).

14.3 All necessary repairs to the building structure must be completed before installation of the system commences.

14.4 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, must be made good prior to installation, to ensure that the insulation boards are installed with a smooth, in-plane finished surface.

14.5 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 should be hacked off and reinstated.

14.6 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.

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

15 Approved installers

Application of the system, within the context of this Certificate, must be carried out by installers approved 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 of the system must be carried out in accordance with the Certificate holder's current installation instructions.

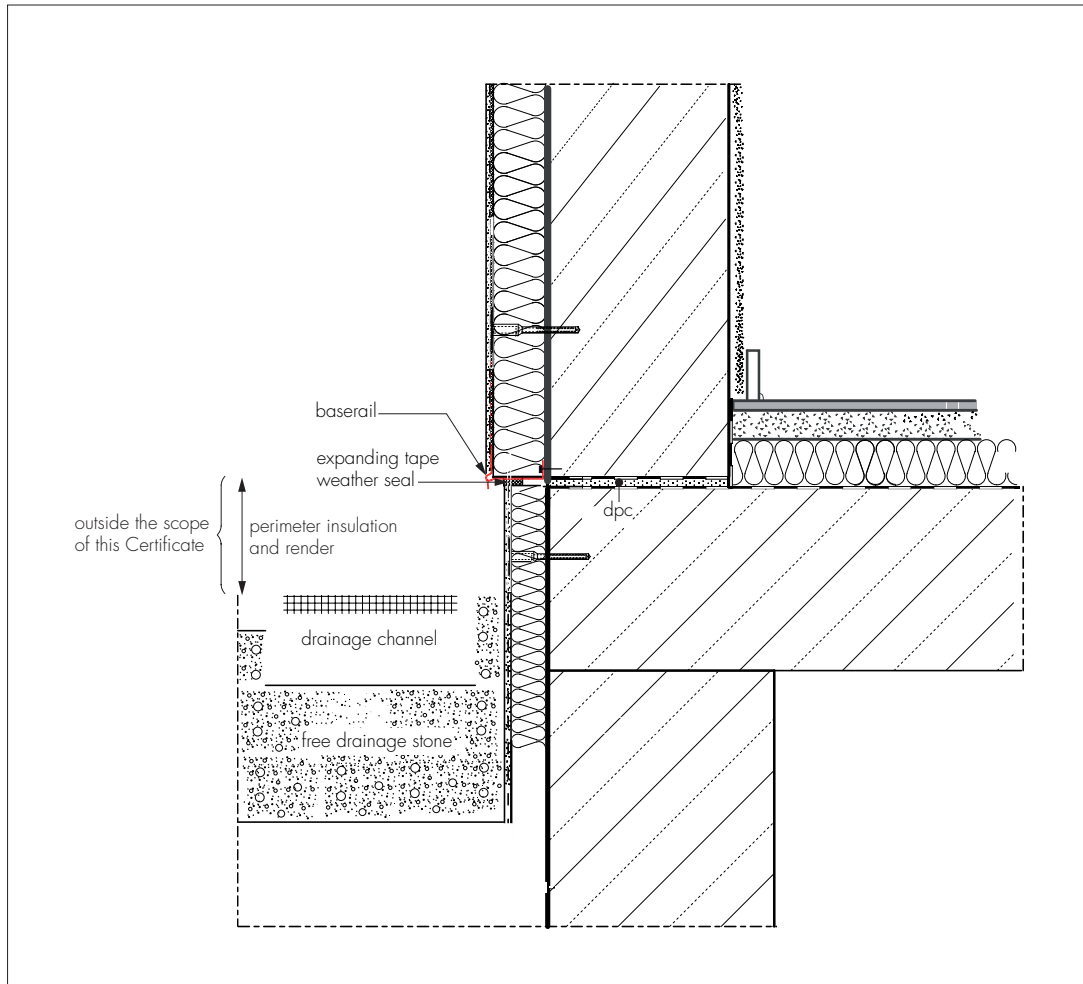
16.2 Weather conditions should be monitored to ensure correct application and curing conditions. Application of coating materials must not be carried out at temperatures below 5°C or above 30°C, nor if exposure to frost is likely, and the coating must be protected from rapid drying. Installation should not take place during rainfall or if rain is anticipated.

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 400 mm maximum centres (see Figure 3). Base rail connectors are inserted at all rail joints. Extension profiles are fixed to the front lip of the base rail or stop end channel where appropriate.

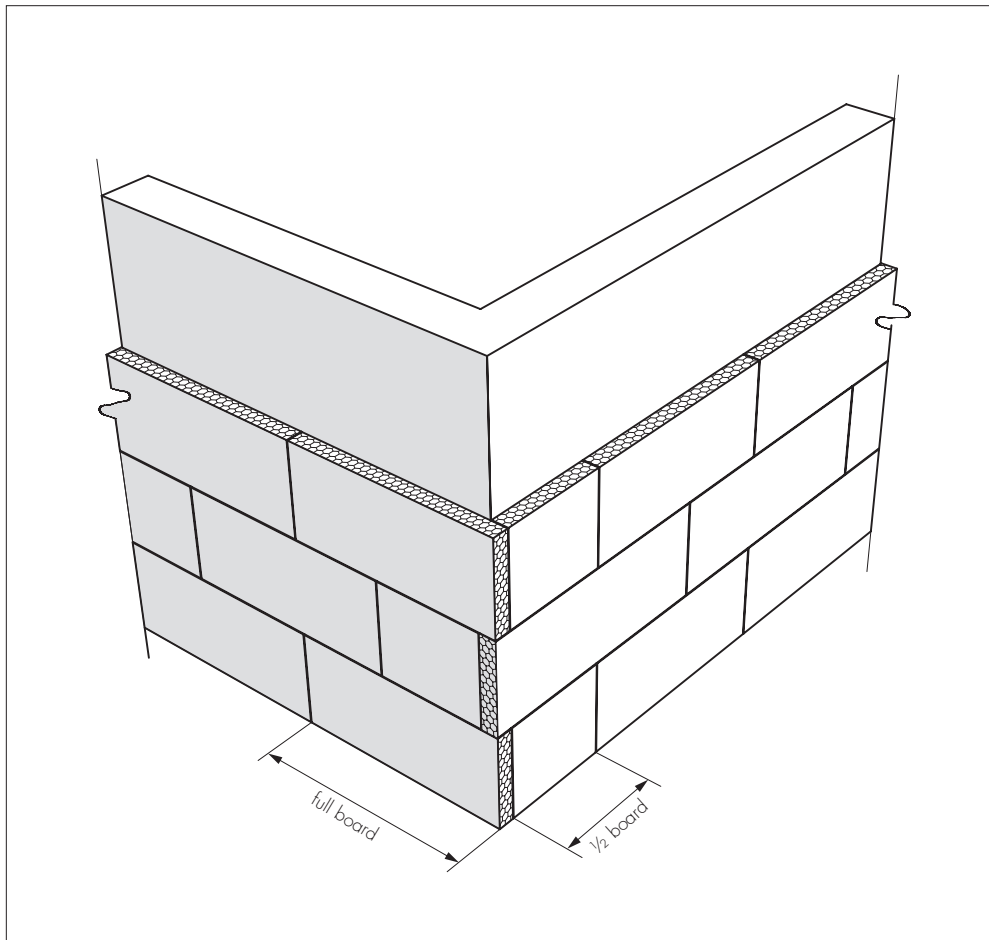
Figure 3 Typical section of base profile



16.5 The supplementary adhesive is prepared with the required amount of water (see section 1), and mixed with a paddle mixer until the desired consistency is achieved. After allowing the adhesive to rest for 5 minutes, it is stirred again. The adhesive is applied in a continuous line around the perimeter of the board with three additional dabs of adhesive distributed uniformly over the remaining surface of the board. Alternatively, it can be applied over the entire face of the insulation board using a notched trowel.

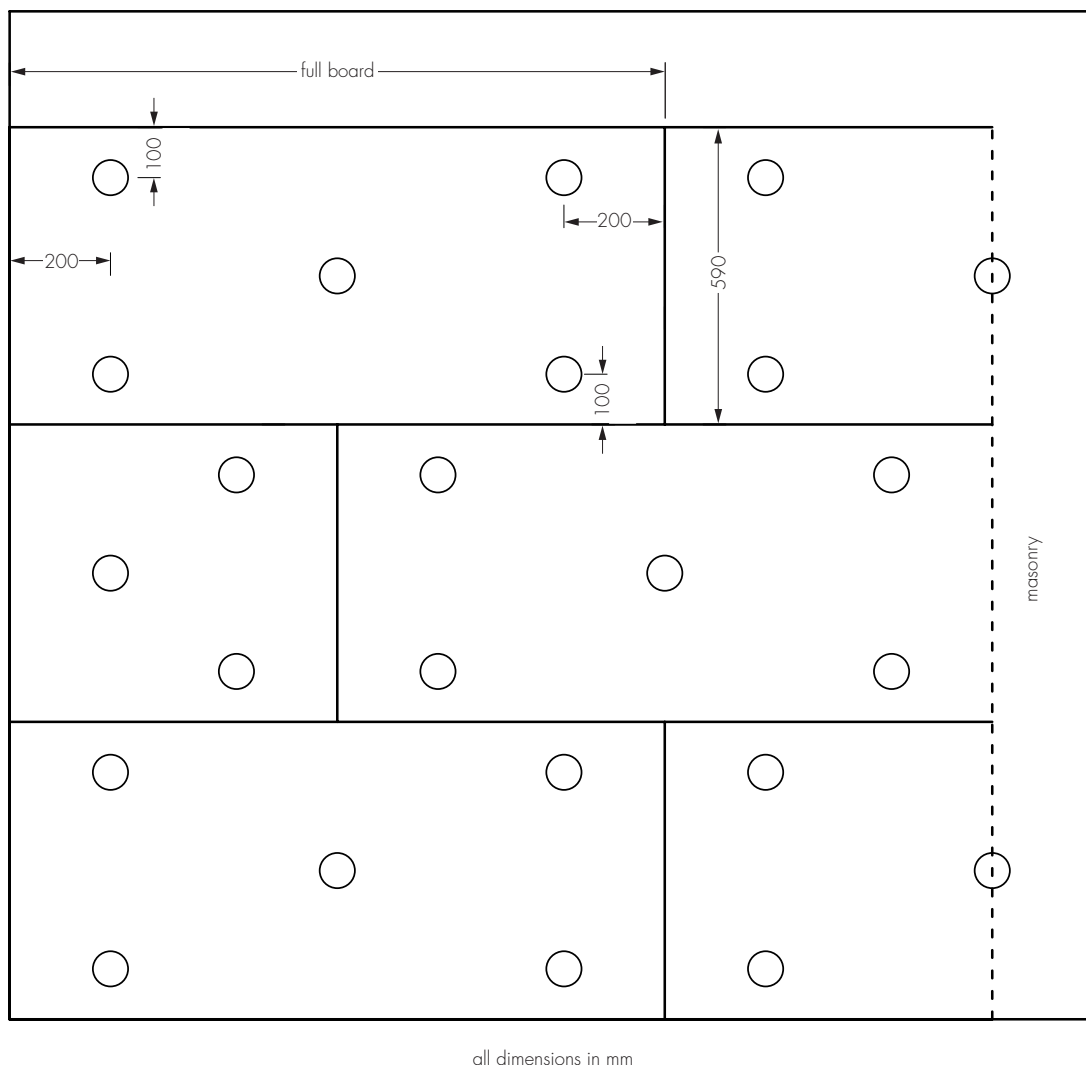
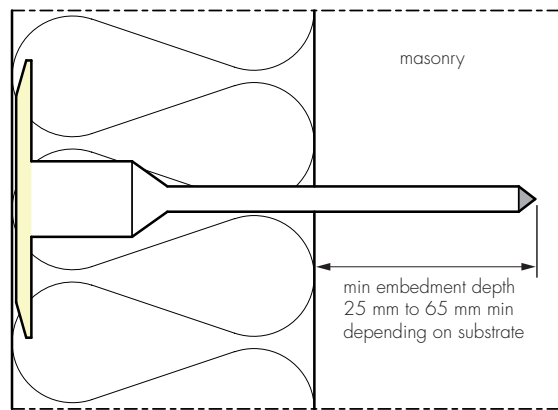
16.6 The first run of insulation boards is positioned on the base profile. The boards must be pressed firmly against the wall and butted tightly together with the vertical joints staggered by at least 200 mm (see Figure 4). Joints between boards greater than 2 mm should be filled. Gaps greater than 10 mm should be closed by repositioning or, where appropriate, by cutting boards to fit. Any gaps, high spots or irregularities are removed by lightly planing with a rasp over the whole surface. Alignment should be checked as work proceeds.

Figure 4 Typical arrangement of insulation boards



16.7 Mechanical fixings are drilled into the substrate to the required depth through the insulation at the corners of each board and at positions which allow a minimum of seven fixings per square metre (see Figure 5). Around openings, additional fixings should be used at 300 mm centres (see Figure 5). The mechanical fixings are inserted and tapped or screwed firmly into place, securing the insulation to the substrate. Boards should be overlapped at building corners and board joints should not occur within 200 mm of the corners of openings.

Figure 5 Insulation board fixing pattern



16.8 To fit around details such as doors and windows, insulation boards may be cut with a sharp knife or a suitable saw (for wood-fibre boards). 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.

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

16.10 Window and door reveals should be insulated to minimise the effects of cold bridging. Where clearance is limited, strips of insulation should be installed.

16.11 Prior to the application of the reinforced basecoat, pre-compressed sealing tape is inserted at window and door frames, overhanging eaves, gas and electric meter boxes, and wall vents, or where the render abuts any other building material or surface. Alternatively, gun-applied joint sealants or sealing beads can be used, in accordance with the Certificate holder's instructions.

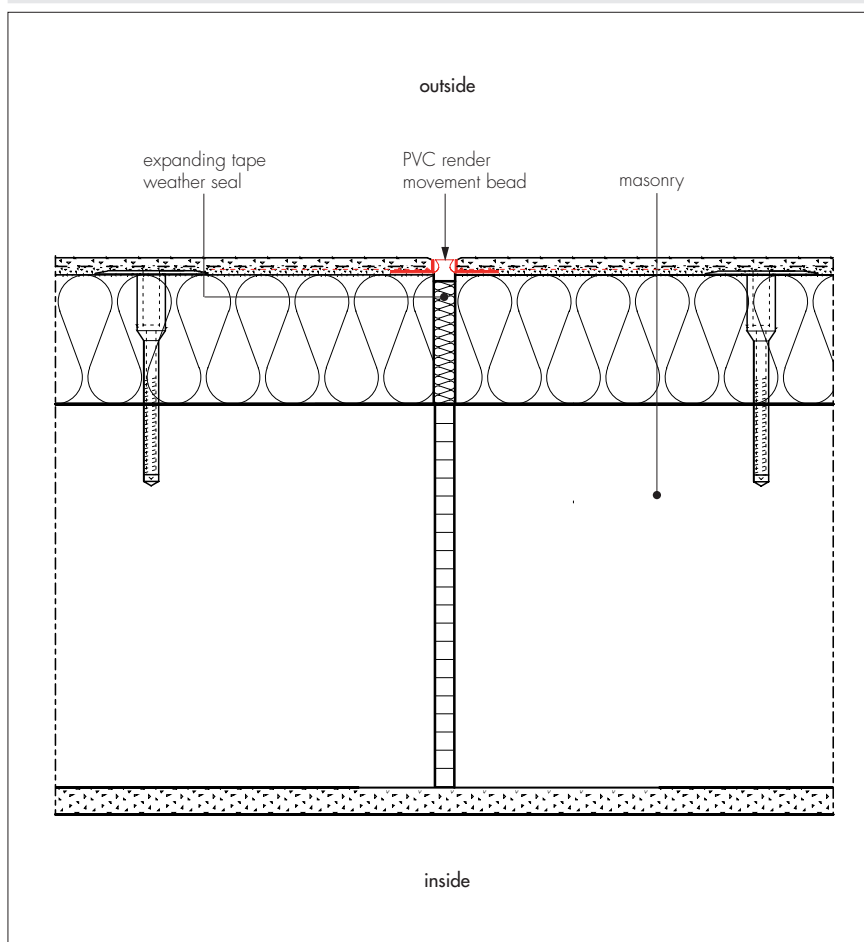
16.12 Installation continues until the whole wall is completely covered including, where appropriate, the building soffits.

16.13 Corner profiles are fixed to all building corners and to door and window heads and jambs.

Movement joints

16.14 Generally, movement joints are not required in the system but, if an expansion joint is already incorporated in the substrate, a movement joint must be provided (see Figure 6).

Figure 6 Vertical movement joint



Application of basecoat and reinforcement mesh

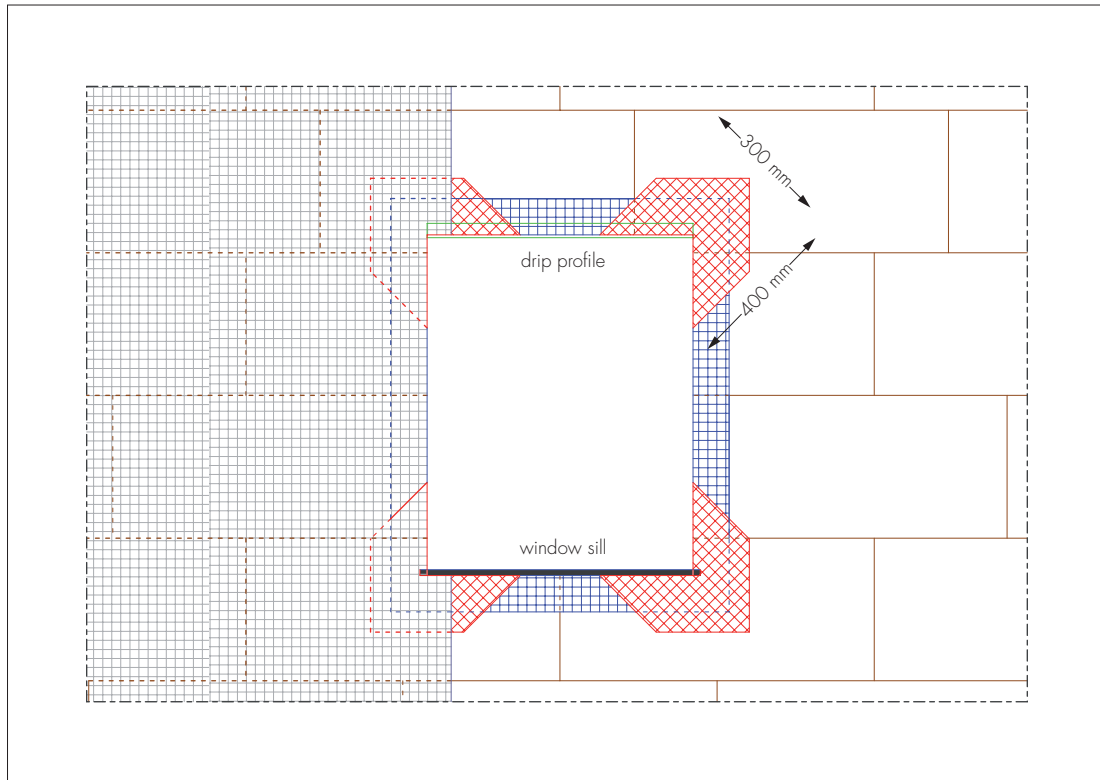
16.15 The basecoat is prepared by mixing each bag with 4 to 4.5 litres of water. The basecoat is applied over the insulation boards using a stainless steel trowel, and floated with a Darby float to a thickness of approximately 5 mm. The reinforcement mesh is immediately embedded into the basecoat by trowelling from the centre to the edge, ensuring that the mesh is free of wrinkles. An additional layer of basecoat is applied whilst still wet, ensuring that the reinforcement mesh is completely covered. The overall thickness of the reinforced basecoat must be greater than 10 mm.

16.16 The basecoat is applied progressively, working in one-metre sections in a vertical or horizontal direction.

16.17 Overlapping at all mesh joints should not be less than 100 mm.

16.18 In all cases, additional pieces of reinforcing mesh (300 mm by 400 mm) are used diagonally at the corners of openings as shown in Figure 7.

Figure 7 Additional reinforcement at openings



16.19 The basecoat should be left to dry thoroughly before application of the finish coat. The drying time will depend upon the conditions, but at least 48 hours should elapse before applying the VWP finish coat, and 10 days before applying the Mineral Silicate Finish coat.

Finishing

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

16.21 Lime Green Finish VWP is applied to the required thickness (see section 1), using a stainless steel trowel and finished with a plastic trowel to create a textured finish. The drying time is dependent on conditions, but will typically be 24 hours.

16.22 Alternatively, if the Lime Green Silicate Mineral Finish (coarse and fine together) is used, it is applied in two coats — firstly, 'coarse' (thinned with up to 10% of water) followed, a minimum of 12 hours later, by 'fine' (thinned with up to 5% of water).

16.23 Continuous surfaces should be completed without a break. Care should be taken to prevent the finish coats from either drying too rapidly or freezing.

16.24 At the tops of walls, the system should be protected by an adequate overhang (see Figure 8) or by an adequately sealed purpose-made flashing. Care should be taken in the detailing of the system around openings and projections (see Figures 9, 10, and 11).

Figure 8 Roof eaves detail

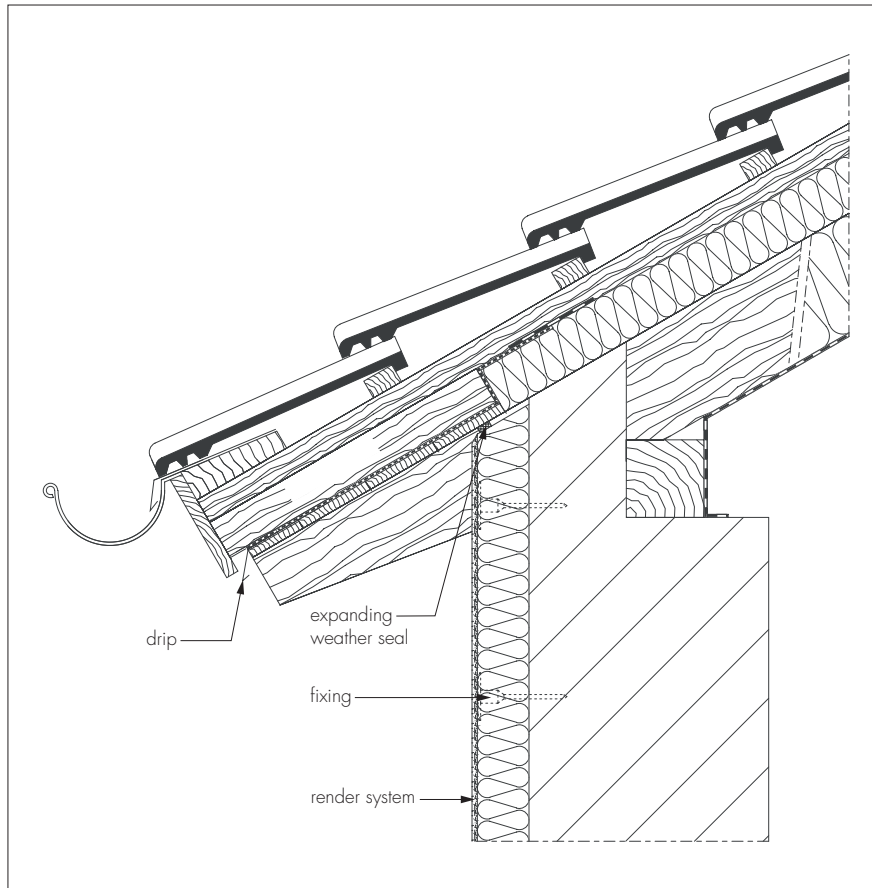


Figure 9 External corner detail

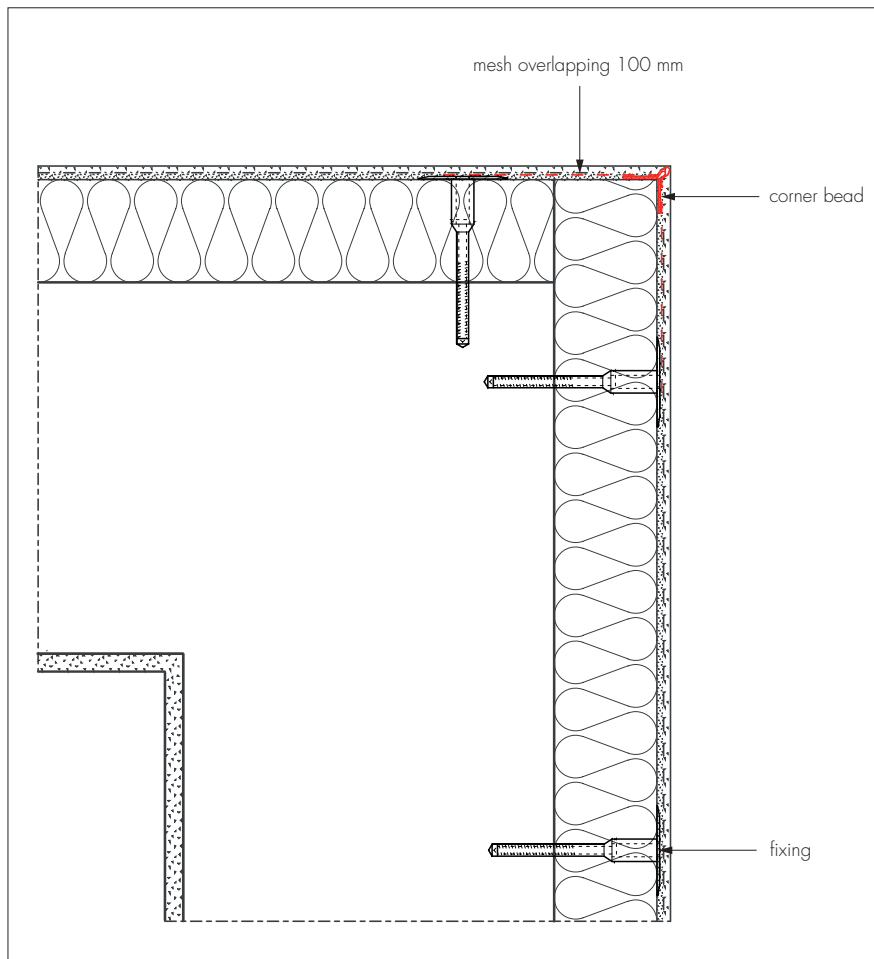


Figure 10 Window reveal

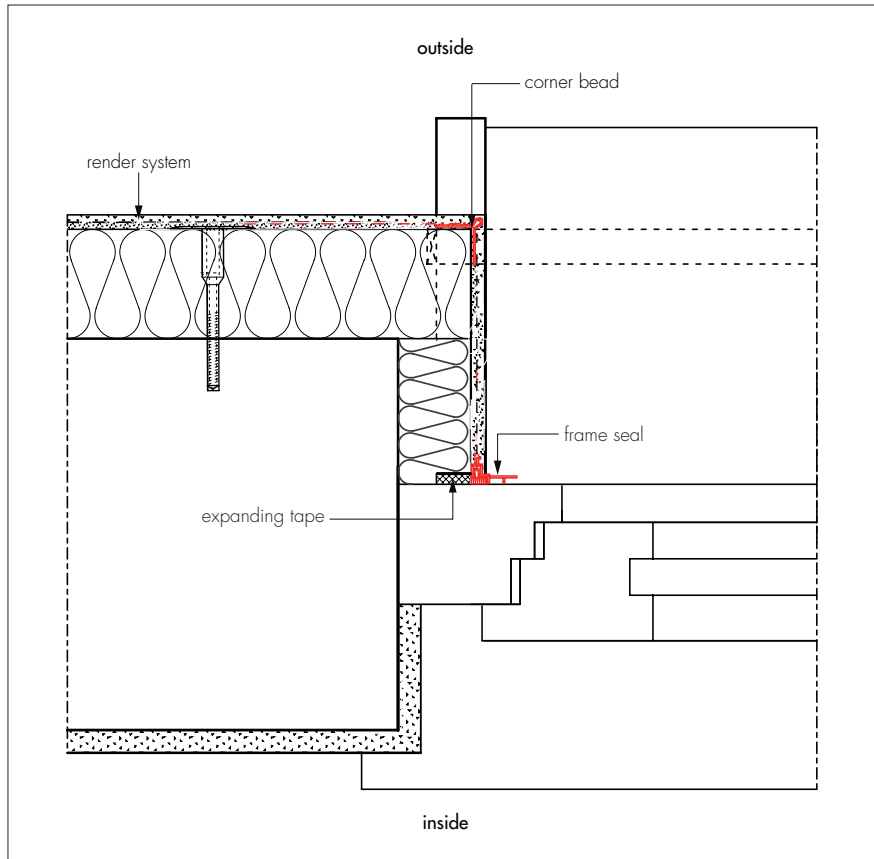
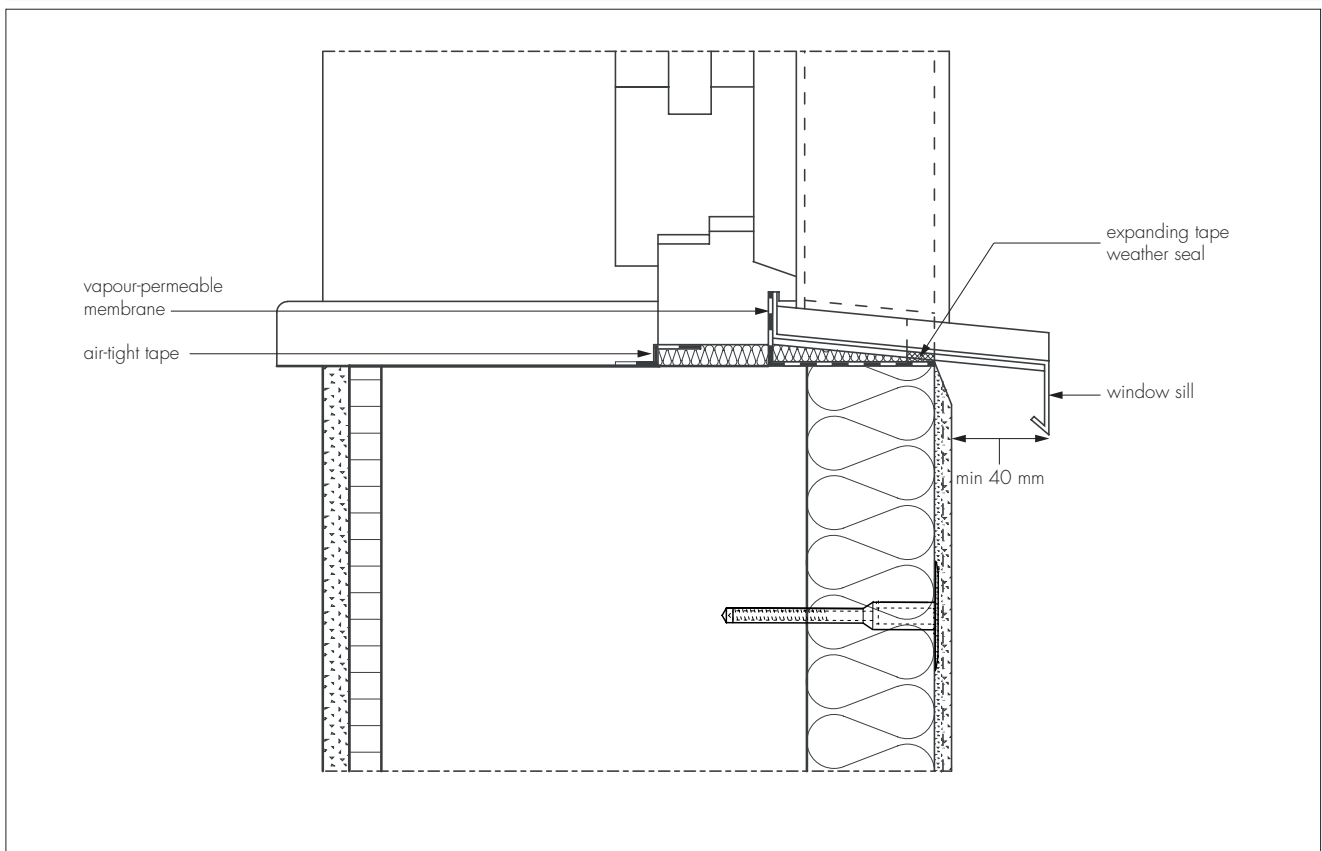


Figure 11 Window sill detail



16.25 On completion of the installation, external fittings, eg rainwater goods, are securely fixed to timber grounds or extended fixings that have been built into the system during installation.

17 Investigations

17.1 An examination was made of data relating to:

- fire performance
- bond strength
- hygrothermal performance
- resistance to frost
- resistance to impact
- water vapour permeability
- fire propagation tests
- surface spread of flame tests
- thermal conductivity
- condensation risk analysis.

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

17.3 The manufacturing process was evaluated, including the methods adopted for quality control, and details were obtained of the quality and composition of materials used.

Bibliography

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BS 8000-2.2 : 1990 *Workmanship on building sites — Code of practice for concrete work — Sitework with in situ and precast concrete*

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

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

BS EN 1992-1-1 : 2004 + A1 : 2014 *Eurocode 2: Design of concrete structures — General rules and rules for buildings*

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BS EN 13171 : 2012 *Thermal insulation products for buildings — Factory made wood fibre (WVF) products — Specification*

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

EOTA TR051 : 2016 *Recommendations for job-site tests of plastic anchors and screws*

Conditions of Certification

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:

- 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.

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.