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Agrément Certificate
18/5576
Product Sheet 5

STRUCTHERMEXTERNAL WALL INSULATION SOLUTIONS

STRUC-SIL M EXTERNAL WALL INSULATION SYSTEM

This Agrément Certificate Product Sheet(1) relates to the Struc-Sil M External Wall Insulation System, comprising mechanically fixed mineral wool (MW) slabs with supplementary adhesive where required, a glass fibre mesh-reinforced basecoat and a render finish. It is suitable for use on the outside of external masonry walls in new or existing domestic and non-domestic buildings with no height restrictions.

(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 be designed to resist the wind loads experienced for a particular location, and has adequate impact resistance. The impact resistance is dependent on the system chosen (see section 7).

Behaviour in relation to fire — the system has an A2-s1, d0 reaction to fire classification in accordance with BS EN 13501-1 : 2007 (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 a least 30 years. The durability can be extended to 60 years by using different fixings and a minimum 40% of supplementary adhesive, and by following a planned inspection and an effective maintenance schedule (see sections 12 and 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

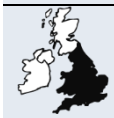
Date of Second issue: 2 July 2021

Originally certificated on 29 November 2018

Hardy Giesler
Chief Executive Officer

Regulations

In the opinion of the BBA, the Struc-Sil M 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 7.16 of this Certificate.
Requirement:	**B4(1)**	**External fire spread**
Comment:		The system is unrestricted by this Requirement. See sections 8.1 to 8.4 of this Certificate.
Requirement:	**C2(b)**	**Resistance to moisture**
Comment:		The system provides 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 11.2 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 6.1 and 6.2 of this Certificate.
Regulation:	**7(1)**	**Materials and workmanship**
Comment:		The system is acceptable. See sections 13.1 and 13.2 and the *Installation* part of this Certificate.
Regulation:	**7(2)**	**Materials and workmanship**
Comment:		The system is unrestricted by this Regulation. See section 8 of this Certificate.
Regulation:	**26**	**CO_2 emission rates 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. See sections 6.1 and 6.2 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 12.1, 12.2, 13.1 and 13.2 and the *Installation* 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 7.16 of this Certificate.
Standard:	2.6	Spread to neighbouring buildings
Comment:		The system is unrestricted by this Standard, with reference to clauses 2.6.4(1)(2), 2.6.5(1) and 2.6.6(2). See sections 8.1 to 8.4 of this Certificate.

Standard:	2.7	Spread on external walls
Comment:		The system is unrestricted by this Standard with reference to clause 2.7.1[(1)(2)]. See sections 8.1 to 8.4 of this Certificate.
Standard:	3.10	Precipitation
Comment:		The system can contribute to 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 contribute to satisfying 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	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[(1)(2)] , 6.1.4[(2)], 6.1.6[(1)], 6.1.8[(2)], 6.1.10[(2)], 6.2.1[(1)(2)], 6.2.3[(1)], 6.2.4[(1)], 6.2.5[(1)(2)], 6.2.6[(2)], 6.2.7[(2)], 6.2.11[(1)] and 6.2.13[(2)]. See sections 6.1 and 6.2 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 the 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)] [Aspect 1[(1)(2)] and 2[(1)]], 7.1.6[(1)(2)] [Aspect 1[(1)(2)] and 2[(1)]] and 7.1.7[(1)(2)] [Aspect 1[(1)(2)]]. See section 6.1 of this Certificate.
Regulation:	**12**	**Building standards applicable to conversions**
Comment:		All comments given for the system under Regulation 9, Standards 1 to 6, also apply to this Regulation, with reference to clause 0.12.1[(1)(2)] and Schedule 6[(1)(2)].

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

The Building Regulations (Northern Ireland) 2012 (as amended)

Regulation:	**23**	**Fitness of materials and workmanship**
Comment:		The system is acceptable. See sections 13.1 and 13.2 and the *Installation* part of this Certificate.
Regulation:	**28(b)**	**Resistance to moisture and weather**
Comment:		Walls insulated with the system will satisfy this Regulation. See section 10.1 of this Certificate.
Regulation:	**29**	**Condensation**
Comment:		Walls insulated with the system will satisfy the requirements of this Regulation. 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 7.15 of this Certificate.
Regulation:	**36(a)**	**External fire spread**
Comment:		The system is unrestricted by this Regulation. See sections 8.1 to 8.4 of this Certificate.
Regulation:	**39(a)(i)**	**Conservation measures**
Comment:		The system can contribute to satisfying this Regulation. See sections 6.1 and 6.2 of this Certificate.

Regulation:	**40**	**Target carbon dioxide emission rate**
Comment:		The system can contribute to satisfying this Regulation. See sections 6.1 and 6.2 of this Certificate.

Construction (Design and Management) Regulations 2015
Construction (Design and Management) Regulations (Northern Ireland) 2016

Information in this Certificate may assist the client, designer (including Principal Designer) and contractor (including Principal Contractor) to address their obligations under these Regulations.

See sections: 3 *Delivery and site handling* (3.2) and 12 *Maintenance and repair* of this Certificate.

Additional Information

NHBC Standards 2021

In the opinion of the BBA, the Struc-Sil M External Wall Insulation System, if installed, used and maintained in accordance with this Certificate, can satisfy or contribute to satisfying the relevant requirements in relation to *NHBC Standards*, Part 6 *Superstructure (excluding roof)*, Chapter 6.9 *Curtain walling and cladding.*

Technical Specification

1 Description

1.1 The Struc-Sil M External Wall Insulation System consists of MW slabs mechanically fixed to the substrate wall, with supplementary adhesive(1) where required (with a minimum of 40% coverage of adhesive), a reinforcing glass fibre mesh embedded in the basecoat, primer and render finish. The system can be designed to achieve either a 30- or 60-year durability (see Table 1 and Figure 1 for both applications, and section 16).

(1) Supplementary adhesive is compulsory for the 60-year durability system.

Table 1 Struc-Sil M External Wall Insulation System

Components	Option 1	Option 2
Supplementary adhesive(1)	Structherm HP14 High Polymer Basecoat	
Insulation	LD MW insulation slabs	DD MW insulation slabs
Basecoat	Structherm HP14 High Polymer Basecoat	
Reinforcement	Reinforcement mesh	
Primer	Struc-Primer	
Finish	Struc- Sil	

(1) Supplementary adhesive is not required for the allowable dry-fixed configurations.

1.2 The system can be designed to achieve either a 30- or 60-year service life (see Figure 1). Mechanical fixings are applied through the insulation slabs for a 30-year system, or through the reinforcement mesh and insulation slabs for 30 or 60-year system, to the external surface of the substrate wall (see section 1.3).

1.3 The following system combinations, by method of fixings, are covered under this Certificate:

- All system combinations that are mechanically fixed through the insulation only (that is, not through the mesh and insulation) and use supplementary adhesive (minimum 40%) – 30-year durability systems only
- All system combinations that are mechanically fixed through mesh/insulation and use supplementary adhesive (minimum 40%)
- Dry-fixed system, 30-year durability system only; the permissible insulation thickness is shown below, along with the finish. The system may be fixed through the insulation only or through the mesh/insulation:

  - Maximum thickness of 200 mm when supplementary adhesive is not used, with Struc-Sil finish
  - As installed, a system with Struc-Sil finish with a maximum weight of 16.3 kg per metre square.

30-year durability

1.4 After the slabs have been secured to the wall with insulation adhesive, where required, and rasped flat, mechanical fixings are installed through the insulation, followed by the basecoat (trowel-applied to the specified thickness) and reinforcement mesh, which is fully embedded within the basecoat. The system is left to cure before application of the finish.

60-year durability

1.5 After the slabs have been secured to the wall with insulation adhesive and rasped flat, the basecoat is trowel applied to the specified thickness, followed by the reinforcement mesh, which is fully embedded within the basecoat. While the basecoat is still wet, mechanical fixings are applied through the mesh and insulation slabs into the substrate, followed by the application of mesh patches over the fixing heads, with more basecoat applied to fully embed the fixing plate and the mesh patches. Additional basecoat is applied to achieve the required thickness, measured from the top of the fixing plate. The system is left to cure before application of the finish.

1.6 Additionally, for the 60-year durability system, the requirements of sections 1.7 (Mechanical fixings), 4.13 and 4.14 must be satisfied.

1.7 The system comprises the following components:

Insulation(1)

- LD MW insulation slabs — 1200 by 600 mm in a range of thicknesses between 100(2) and 260 mm in 10 mm increments, with a nominal density of 105 kg·m^{-3} and a minimum tensile strength of 10 kN·m^{-2}. Slabs are manufactured to comply with the requirements of BS EN 13162 : 2012
- DD MW insulation slabs — 1200 by 600 mm in a range of thicknesses between 50(2) and 260 with an average density of 110 kg·m^{-3} and a minimum tensile strength of 10 kN·m^{-2}. Slabs are manufactured to comply with the requirements of BS EN 13162 : 2012

(1) For declared thermal conductivity values (λ_D), see section 6.1
(2) Insulation thicknesses of 20, 30 and 40 mm would generally be used in reveals.

Mechanical fixings

- mechanical fixings(1)(2)(3) — anchors with adequate length to suit the substrate and the insulation thickness, approved and supplied by the Certificate holder, and selected from:
  - Ejotherm NT U — high-density polyethylene (HDPE) anchor sleeve with steel galvanized centre pin
  - Ejotherm STR U — HDPE anchor sleeve and polystyrene anchor cap with steel galvanized centre pin

(1) Ejot SBL 140 Plus washer — a proprietary 140 mm diameter polyamide extension washer, can be used in conjunction with the above anchors to enhance the pull-through strength capacity.
(2) Other fixings may be used provided they can be demonstrated to have equal or higher pull-out, plate diameter and plate stiffness characteristics. When dry-fixed (no supplementary adhesive) is used, only fixings with metal pins may be specified.
(3) Polyethylene, HDPE or polyamide ribbed anchor sleeve with a stainless pin to achieve a 60-year durability performance.

Basecoat and supplementary adhesive

- Structherm HP14 High Polymer Basecoat — a cement-based, polymer-modified basecoat. Supplied as a powder, mixed with 5 to 6 litres of clean water, and applied in two layers to an overall thickness of 4 to 6 mm, with a coverage of 8 to 11 kg·m^{-2}

Reinforcement

- reinforcing mesh — an alkali-resistant glass fibre mesh in 50 by 1 m rolls, with a 3.5 by 3.5 mm mesh size, organic content of 20%, PCS value of 8.17 $MJ \cdot kg^{-1}$ and a nominal weight of 160 $g \cdot m^{-2}$

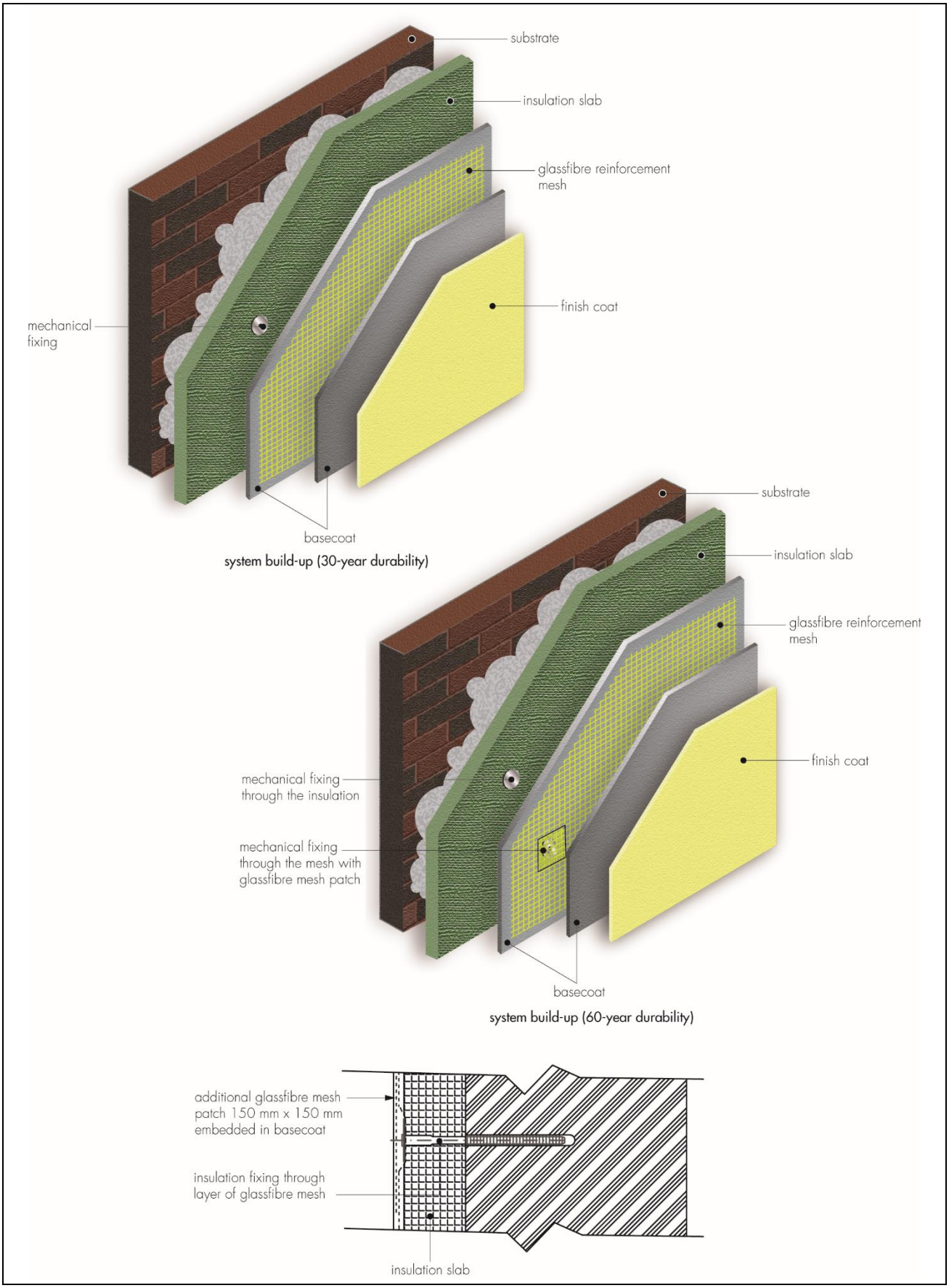
Primer

- Struc-Primer— available in a range of colours to suit the colour of finish selected

Finish

- Struc-Sil— a decorative topcoat in 15 and 30 grades, available in a range of colours, with an approximate density of 1.8 $kg \cdot m^{-3}$. It is mixed with a small amount of water to achieve optimum consistency and has a coverage of approximately 2.5 $kg \cdot m^{-2}$ for Struc-Sil 15, and a coverage of 5.0 $kg \cdot m^{-2}$ for Struc-Sil 30.

Figure 1 The Struc-Sil M External Wall Insulation System



1.8 Ancillary materials also used with the system:

- aluminium, powder-coated galvanized steel, PVC-U or stainless steel base profile
- aluminium, powder-coated galvanized steel, PVC-U or stainless steel edge profile
- aluminium, powder-coated galvanized steel, PVC-U or stainless steel corner profile
- aluminium, powder-coated galvanized steel, PVC-U or stainless steel stop profile
- aluminium, powder-coated galvanized steel, PVC-U or stainless steel V expansion and movement joint profiles.

1.9 Ancillary materials also used with the system, but outside the scope of this Certificate, are:

- profile connectors and fixings
- silicone-based joint sealant
- algal and fungal wash
- PU foam filler
- sealing tape.

2 Manufacture

2.1 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.

2.2 The management system of Structherm Ltd has been assessed and registered as meeting the requirements of BS EN ISO 9001 : 2015 and BS EN ISO 14001 : 2015 by Construction Products Certification (CPC) (Certificates Number CP 000214 and CPE 00045).

3 Delivery and site handling

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

3.2 Components are delivered in the quantities and packages listed in Table 2. Each package carries the manufacturer's and product identification and batch number. The basecoat and render finish also include the BBA logo incorporating the number of this Certificate.

Table 2 Component supply details

Component	Quantity and packaging
Struc-Sil	25 kg tub
Struc-Primer	15 kg tub
Structherm HP14 High Polymer Basecoat	25 kg bag
Reinforcing mesh	50 by 1 m roll
Mechanical fixings	boxed by the manufacturer

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

3.4 Slabs that become damaged, soiled or wet should be discarded.

3.5 The render components should be stored in dry conditions, off the ground, and protected from frost at all times. Bags of unopened render will have a shelf-life of 12 months when stored correctly. Damaged, wet or contaminated products should not be used and must be discarded.

Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on the Struc-Sil M External Wall Insulation System.

Design Considerations

4 General

4.1 The Struc-Sil M 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) without height restrictions. Prior to installation of the system, wall surfaces should comply with section 14.

4.4 New walls subject to the 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 8000-0 : 2014
- BS 8000-2.2 : 1990
- 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.

4.6 Movement joints should be incorporated into the system in line with existing movement joints in the building structure, 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.

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 the system is installed and maintained in accordance with the conditions set out in this Certificate.

4.13 The system can be adapted to achieve an extended service life of 60 years instead of the standard 30. The difference between 30- and 60-year durability systems is covered in sections 1.1 to 1.3, with the detailed installation procedure covered in section 16.

4.14 For 60-year durability systems, the following components must be constructed from stainless steel grade 1.4301 to BS EN 10088-2 : 2014:

- base profile and render stop end including the fixings. In addition, any other profile component which would remain exposed after the application of the finish coat
- corner profile (if exposed after application of the system)
- pin or screw for mechanical fixings.

5 Practicability of installation

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

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

6 Thermal performance

6.1 Calculations of thermal transmittance (U value) should be carried out in accordance with BS EN ISO 6946 : 2017 and BRE Report BR 443 : 2006, using the thermal conductivity (λ_D) value of 0.036 $W \cdot m^{-1} \cdot K^{-1}$.

6.2 The U value of a completed wall will depend on the insulation thickness, the type and number of fixings, and the insulating value of the substrate masonry and its internal finish. Calculated U values for sample constructions in accordance with the national Building Regulations are given in Table 3, and are based on the thermal conductivity value given in section 6.1.

Table 3 Insulation thickness required to achieve design U values[1][2][3]

U value[4] ($W \cdot m^{-2} \cdot K^{-1}$)	Thickness of insulation[3] (mm)	
	215 mm brickwork, $\lambda = 0.56\ W \cdot m^{-1} \cdot K^{-1}$	200 mm dense blockwork, $\lambda = 1.75\ W \cdot m^{-1} \cdot K^{-1}$
0.18	190	200
0.19	180	190
0.25	140	150
0.26	130	140
0.28	120	130
0.30	110	120
0.35	90	100

(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 ($\lambda = 0.88\ W \cdot m^{-1} \cdot K^{-1}$) with an external render thickness of 14 mm (with $\lambda = 1\ W \cdot m^{-1} \cdot K^{-1}$). Declared thermal conductivity (λ_D) value of insulation is as noted in section 6.1.

(2) Calculations based on a system that included 7 stainless steel fixings per square metre with a point thermal transmittance (x_p) of 0.002 $W \cdot K^{-1}$ per steel pin. Use of other types of fixings should be calculated in accordance with BS EN ISO 6946 : 2017.

(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 to 0.42 $W \cdot m^{-2} \cdot K^{-1}$ depending on wall type.

6.3 Care must be taken in the overall design and construction of junctions with other elements and openings to minimise thermal bridges and air infiltration. 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). 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 7.7).

7.2 The substrate and supporting structure must be capable of transferring all additional loading due to the installation of 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 of the system, wind and impact.

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

7.6 Negative wind load transfer to the substrate wall depends on the application of mechanical fixings and respective primary resistance mechanisms.

Primary resistance mechanisms of mechanically fixed EWIS with supplementary adhesive, through insulation(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 fixed through insulation, 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 the test results was 10 $kN \cdot m^{-2}$. 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 : 2016 (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 factor
Ejotherm NT U	05/0009	Concrete C12/15/Clay bricks	8	25	1.2 1.5	2
Ejotherm STR U	04/0023	Concrete C12/15/Clay bricks	8	25	1.5	2

(1) The minimum value for plate stiffness of the fixings is 0.6 $kN \cdot mm^{-1}$ and the load resistance is 1.4 kN when pull-through tests are undertaken with the IDK fixings (which have been discontinued). The load resistance is 2.43 kN when pull-through tests are undertaken with Ejotherm NTU fixings.
(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 head and a 140 mm diameter extension washer and minimum insulation thickness of 60 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)	**MW insulation (1200 x 600 mm)**							
	Pull-through							
Tensile resistance of the insulation (kPa)	≥ 10							
Fixing type(1)	Ejot IDK						Ejotherm NTU	
Fixing plate diameter (mm)	60	60 + SBL 140 Plus	60	60 + SBL 140 Plus	60	60 + SBL 140 Plus	60	60 + SBL 140 Plus
Insulation thickness (mm)	60		100		140		200	
Characteristic pull-through resistance(2) per fixing (kN)	0.14	0.12	0.21	0.23	0.27	0.34	0.38	0.45
Partial factor(3)	2.5							
Design pull-through resistance per fixing (N_{RD3}) (kN)	0.06	0.05	0.08	0.09	0.11	0.14	0.15	0.18
Design pull-through resistance per slab (kN) (based on minimum number of fixings)(4)	0.3	0.2	0.4	0.36	0.55	0.56	0.75	0.72
Design pull-through resistance per slab (kN) (based on maximum number of fixings)(5)	0.72	0.4	0.96	0.72	1.32	1.12	1.8	1.44

(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 slabs are quality controlled and tested to establish tensile strength perpendicular to the face of the slab.

(4) The minimum design pull-through resistance per slab is based on a minimum of 5 fixings (for fixing without the washer) and 4 fixings (for fixing with the 140 mm washer) per slab (1200 x 600 mm), which equates to approximately 7 fixings (for fixing without the washer) and to 6 fixings (for fixing with the 140 mm washer) per m^2. The design resistance for the minimum number of fixings is based on the fixing pattern provided in Figure 4 of this Certificate and minimum insulation thickness specified in the Table. The fixing pattern and interaction of the fixings should be considered when calculating the design resistance per slab.

(5) The maximum design pull-through resistance per slab is based on a maximum of 12 fixings for fixing without the washer and 8 fixings (for fixing with the 140 mm washer) per slab (1200 x 600 mm), which equates to approximately 17 fixings (for fixing without the washer) and to 11 fixings (for fixing with the washer) per m^2. The design resistance for the maximum number of fixings is only applicable to the minimum insulation thickness (60 mm) tested and as specified in the Table. The fixing pattern, insulation thickness and interaction of the fixings should be considered when calculating the design resistance per slab.

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 the fixings should be symmetrically positioned and evenly distributed about the centre of the slab both vertically and horizontally except at openings and building corners.

7.11 Dry-fixed installations correctly designed in accordance with this Certificate will safely accommodate the applied loads due to the self-weight of the system, wind and impact for the systems described in section 1.3 of this Certificate, any render system and fixings as per section 1.7 of this Certificate. Seals and interfaces with the render system should be designed and detailed to accommodate this movement.

7.12 The data derived from sections 7.6 to 7.9 must be assessed against the design wind load and the following expression must be satisfied for safe design:

$Rd \geq W_e$

$Rd_{b.ins/rend} = A_r * N_{RD1}$
$Rd_{pull\text{-}out} = n * N_{RD2}$

$Rd_{pull\text{-}through} = (N_{RD3panel} * n_{panel}) + (N_{RD3joint} * n_{joint})/A_{panel}$

Where:

Rd	is the design ultimate resistance ($kN \cdot m^{-2}$) taken as the minimum of $Rd_{b.ins/rend}$, $Rd_{pull\text{-}out}$ and $Rd_{pull\text{-}through}$
W_e	is the maximum design wind load ($kN \cdot m^{-2}$)
$Rd_{b.ins/rend}$	is the design bond resistance between the insulation and render ($kN \cdot m^{-2}$)
$Rd_{pull\text{-}out}$	is the design pull-out resistance of the insulation fixings per metre square ($kN \cdot m^{-2}$)
$Rd_{pull\text{-}through}$	is the design pull-through resistance of the insulation fixings per metre square ($kN \cdot m^{-2}$)
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 ($kN \cdot m^{-2}$)
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 pull-through resistance per anchor not placed at the panel joint, based on test (kN)
$N_{RD3joint}$	is the design pull-through 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).

7.13 The insulation system is mechanically fixed to the substrate wall with a minimum of 5 fixings per slab or approximately 7 fixings per square metre (or, if the 140 mm extension washer is used, 4 fixings per slab or approximately 6 fixings per square metre), as per the fixing patterns shown in Figure 5 (and in conjunction with a minimum 40% coverage of supplementary adhesive where required) (see section 16). Additional fixings may be required, depending on the results of the calculations detailed above for the specific site.

Primary resistance mechanisms of mechanically fixed EWIS with supplementary adhesive through mesh/insulation(1)(2)

- the cohesion resistance of the rendering system
- the pull-out resistance of the fixing from the substrate wall (see section 7.8)
- the resistance of the anchor plate to breakdown or detachment
- the resistance of mesh fabric to tearing around the anchor plate.

(1) For mechanically fixed systems with supplementary adhesive fixed through the mesh/insulation, the resistance of the system to negative wind load is obtained from Static Foam Block (SFB) test
(2) Further guidance is available from BBA Guidance Note 1, available on the BBA website (www.bbacerts.co.uk).

7.14 The static foam block (SFB) test was carried out on the Struc-Sil M External wall insulation System, mechanically fixed onto a masonry substrate. MW insulation slabs of 100 mm thickness were initially fixed with 1 fixing through the insulation and 4 fixings applied through the reinforcement mesh, or 7 fixings per square metre (Ejotherm mushroom head fixings NTU 135), before the render finish was applied. The maximum characteristic negative wind load resistance that can be sustained by the system as determined from the static foam block test is 5.10 $kN \cdot m^{-2}$. The maximum design wind load resistance (Rd_{Test}) is derived by dividing the maximum characteristic wind load resistance by a partial factor of 2.5 and equal to 2.04 $kN \cdot m^{-2}$(1)(2)(3)(4)(5).

(1) The maximum design wind load that can be resisted by the system corresponds to the maximum allowed spacing, centres and layout of fixings, as described in 7.13. This fixing and profile configuration with appropriately selected fixings will also adequately transfer the system's self-weight, wind and impact loads to a suitable substrate wall.
(2) The SFB test is carried out on the system without supplementary adhesive. Minimum coverage area of supplementary adhesive in the actual installation must be 40%
(3) The partial factor for SFB is based on the mode of failure obtained in the test.
(4) The design resistance is determined by dividing the characteristic resistance value obtained from a SFB test by a partial factor of 2.5. The characteristic resistance value obtained from a SFB test was 5.10 $kN \cdot m^{-2}$.
(5) Alternative fixings may be used provided it can be demonstrated that they have equal or higher plate diameter (minimum 60 mm), plate stiffness (/0.6 $KN \cdot mm^{-1}$) and anchor plate load resistance (≥ 2.43 kN) characteristics.

7.15 The data derived from sections 7.8 and 7.14 must be assessed against the design wind load, and the following expressions must be satisfied for safe design:

$R_{dTest} \geq W_e$ and $n_{RD2} \geq W_e$

where:

R_{dTest} is the design negative wind load resistance of the system based on test ($kN \cdot m^{-2}$)
W_e is the maximum design wind load ($kN \cdot m^{-2}$)
n_{RD2} is the design pull-out resistance of the system and is based on characteristic values from site tests and the number of fixings per unit area must be ≥ as tested in SFB test ($kN \cdot m^{-2}$).

7.16 The insulation system is mechanically fixed through mesh/insulation to the substrate wall with a minimum of 1 fixing through the insulation and 4 fixings applied through the reinforcement mesh, or 7 fixings per square metre, as per the fixing patterns shown in Figure 6, and in conjunction with a minimum 40% coverage of supplementary adhesive (see section 16). The design wind load resistance is only applicable to the system tested and as described in section 7.14. No enhancement to the wind load resistance may be gained by the addition of fixings; however, additional fixings may be required depending on the design and installation conditions.

Impact resistance

7.17 Hard body impact tests were carried out in accordance with ETAG 004 : 2013. The system is suitable for use in Use Categories II and III(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 for the system is A2-s1, d0 in accordance with BS EN 13501-1 : 2007(1).

(1) A copy of the report is available from the Certificate holder.

8.2 The classification applies to the full range of thicknesses and colours covered by this Certificate.

8.3 The insulation materials in isolation have a fire classification of class A1 in accordance with BS EN 13501-1: 2007

8.4 The system is suitable for use without height restrictions on, or at any distance from, the boundary.

8.5 For application to second storey walls and above it is recommended that the designer includes at least one stainless steel fixing per square metre, as advised in BRE Report BR 135 : 2013.

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

8.7 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, service penetrations and combustibility limitations for other materials and components used in the overall wall construction.

9 Proximity of flues and appliances

Detailed guidance can be found in the documents supporting the national Building Regulations for the provisions that are applicable when the system is installed in close proximity to certain flue pipes and/or heat-producing appliances.

10 Water resistance

10.1 The system will provide a degree of protection against rain ingress. Care should be taken to ensure that walls are adequately weathertight prior to application of the system. The 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 The guidance given in BRE Report BR 262 : 2002 should be followed in connection with the water resistance 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 a coping, adequate overhang or other detail designed for use with this type of system (see section 16.28).

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 penetrations at junctions between the system and windows to minimise the risk of condensation. The recommendations of BS 5250 : 2011 should be followed.

Surface condensation

11.2 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 6.3.

11.3 Walls 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 : 2011 (Section 4, and Annexes D and G) and BRE Report BR 262 : 2002.

Interstitial condensation

11.4 Walls incorporating the system will adequately limit the risk of interstitial condensation when they are designed and constructed in accordance with BS 5250 : 2011 (Section 4, and Annexes D and G) and section 11.5 of this Certificate.

11.5 The water vapour resistance factor (μ) (for the insulation slabs) and equivalent air layer thickness (s_d) (for the render systems) are shown in Table 6.

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

Layers	Thickness (mm)	s_d (m)	μ
Mineral wool (MW)	40 to 260	–	1
Rendering system:			
Basecoat + finish coat, as indicated below:			
Struc-Sil	8.5	0.33	–

12 Maintenance and repair

12.1 An initial inspection should be made within 12 months and regularly thereafter to include:

- 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 system 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 : 2016.

12.3 For a 60-year durability, a detailed maintenance plan must be prepared and provided to the building manager/owner on completion. As a minimum, this should include an inspection for evidence of defects 12 months after the application and subsequently every five years. This plan should include full details of the required inspection regime; a record of these inspections should be retained.

13 Durability

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

13.2 The system's service life can be extended to 60 years provided a planned inspection and maintenance programme is introduced, in accordance with section 12. An extended 60 years' service life requires the use of stainless steel base, stop end and corner profiles, stainless steel fixings or centre pin Grade 1.4301 and plastic anchor sleeve materials such as polyamide (PA6 and PA6.6), polyethylene (PE) or polypropylene (PP) and following of an appropriate repair and maintenance schedule as covered by the Certificate holder's repair and maintenance manual. In order to achieve this, and depending on the building's location, degree of exposure and detailing, it may be necessary to repair or replace isolated areas. Any damage to the surface finish must be repaired within a time period as stated in the Certificate holder's maintenance manual.

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

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.

Installation

14 Site survey and preliminary work

14.1 A pre-installation survey of the property must be carried out to determine suitability for installation and the need for any necessary repairs to the building structure before application of the system. A specification is prepared for each elevation of the building indicating:

- the position of beads
- detailing around windows and doors and at eaves
- damp-proof course (dpc) level

- exact position of expansion joints, if required
- additional corner mesh and reinforcement, where required
- areas where flexible sealants must be used
- any alterations to external plumbing, if required.

14.2 The survey should include tests conducted on the walls of the building by the Certificate holder or their approved installers (see section 15) to determine the pull-out resistance for mechanical fixings for the appropriate substrate. 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 fixing's pull-out resistance test data. In addition, the type and number of fixings are selected (see sections 7, 16.16 and 16.23). The advice of the Certificate holder should be sought to ensure the proposed fixing pattern is sufficient.

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

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

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

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

14.7 All modifications and necessary repairs to the building structure must be completed before installation commences.

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 Application must be carried out in accordance with the Certificate holder's current installation instructions and this Certificate.

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, or if exposure to frost is likely, and the coating must be protected from rapid drying.

16.3 All rendering should be in accordance with the relevant recommendations of BS EN 13914-1 : 2016.

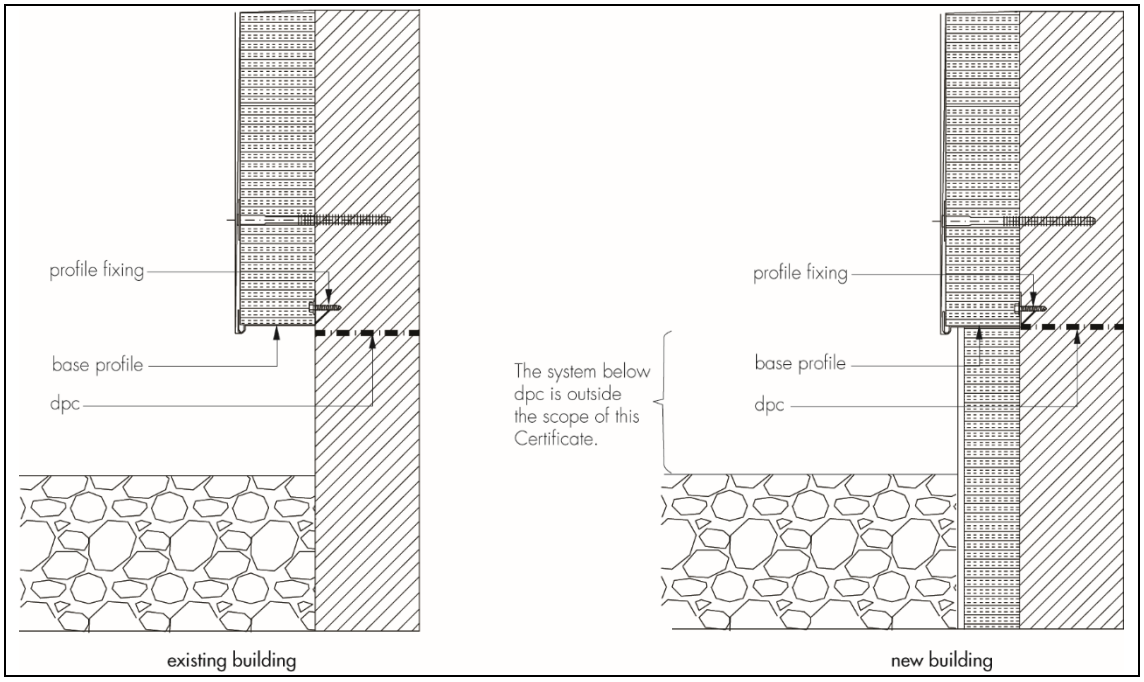
16.4 The initial installation procedure is common to both systems (see section 1.1) and is described in sections 16.5 to 16.14 and 16.25 to 16.31.

Positioning and securing slabs

16.5 The base profile is secured to the external wall above the dpc using the approved profile fixings at approximately 300 mm centres (see Figure 2). Base profile connectors are inserted at all rail joints. Clip-on drip beads are fixed to the front lip of the base profile, where appropriate.

Note: For 60-year durability applications, the base profile needs to be constructed using stainless steel material.

Figure 2 Typical section of base profile



16.6 For systems where the supplementary adhesive is required, the supplementary adhesive is prepared with the required amount of water (see section 1.3) and mixed with a paddle mixer until the desired consistency is achieved. After allowing the adhesive to rest for 5 minutes, it is applied in a continuous bordering strip around the perimeter of the slab with three additional dabs of approximate width between 10 and 40 mm distributed uniformly over the remaining surface. Alternatively, a serrated edge trowel with 5 mm serrations can be used to apply the adhesive to the entire rear surface of the slab.

16.7 The first run of slabs is positioned on the perforated base profile, which is securely fixed to the substrate using the project-specific fixing type, and butted tightly together. Subsequent rows of slabs are positioned so that vertical joints are staggered and overlap at the building corners by at least 200 mm. Joints between slabs greater than 2 mm should be filled with PU foam filler. Gaps greater than 10 mm should be closed by repositioning or, where appropriate, by cutting slabs to fit. Alignment should be checked as work proceeds.

16.8 Mechanical fixings are applied through each slab to secure them during installation of the system. Holes are drilled into the substrate to a required depth. Care must be taken to ensure that the depth of embedment of the fixing into the substrate is as specified. Allowance is made where either existing render is on the wall or dubbing out render has been used to align the slabs as the effective embedment will be reduced. Depending on the project design requirements, mechanical fixings are inserted directly through the insulation or the reinforcing mesh (after basecoat has been applied) and insulation, and hammered or screwed into place depending on the type specified, securing the slab to the substrate.

16.9 To fit around details such as doors and windows, the slabs 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, but their performance is outside the scope of this Certificate.

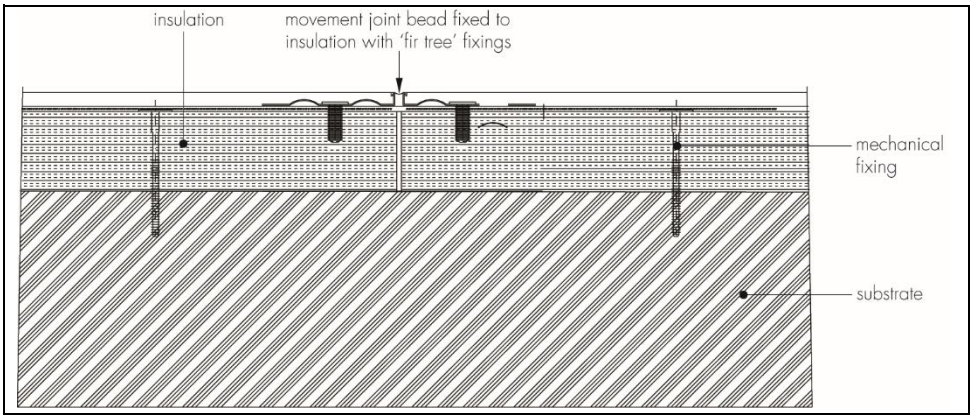
16.10 Installation continues until the whole wall is completely covered including, where appropriate, the building soffits. Periodic checks should be carried out as work proceeds.

16.11 Window and door reveals should be insulated to minimise the effects of cold bridging. Where clearance is limited, strips of approved insulation should be installed to suit available margins and details.

Movement joints

16.12 Generally, surface-mounted movement joints are required at maximum 10 m centres but, if an expansion joint is incorporated in the substrate, then movement joints must be carried through the system (see Figure 3). This may necessitate the use of back-to-back full system stop beads with a mastic seal and backer strip depending on the width of the joint and the degree of movement anticipated. Additional expansion joints in the system are determined by the Certificate holder at the time of the initial survey. Each project is considered on its own merits and the Certificate holder will take into account construction format, building design and fenestration when determining the regularity and positioning of both vertical and horizontal expansion joints in the system.

Figure 3 Movement joint detail



Basecoat and reinforcing mesh

16.13 Prior to the application of the reinforcement mesh, a bead of low-modulus silicone sealant is applied at window and door frames, overhanging eaves, gas and electricity meter boxes, and wall vents, or where the render abuts any other building material or surface. Alternatively, an appropriate sealing tape may be used between the insulation and the object to provide a weatherproof seal, or a surface-applied fillet of low-modulus silicone sealant can be used between the render and the object.

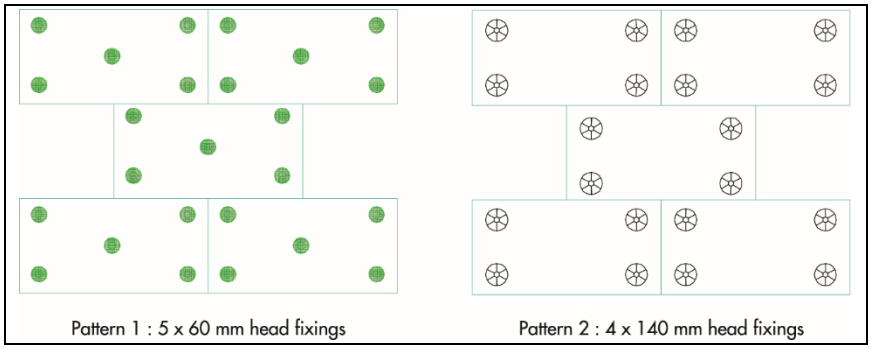
16.14 Structherm HP14 High Polymer Basecoat should be mixed with 5 to 6 litres of potable water per 25 kg bag for a minimum of 5 minutes with an electric paddle mixer to disperse the additives.

16.15 Building corners, door and window heads and jambs are formed using mesh angle profiles bonded to the insulation in accordance with the manufacturer's instructions.

Application of 30-year durability system — mechanical fixings through the slabs

16.16 After the slabs are initially fixed to the wall, holes are drilled through the slab into the substrate wall to the required depth at the specified frequency and pattern, six to seven fixings per square metre (see Figure 4). The mechanical fixings are inserted and tapped or screwed firmly into place, securing the slabs to the substrate.

Figure 4 Typical fixing pattern of insulation slabs — 30-year durability



16.17 A thickness of 3 mm of basecoat should be applied to the surface of the insulation using a stainless steel trowel or a render pump.

16.18 The reinforcing mesh is immediately embedded in the wet basecoat using the trowel. The sheets of reinforcing mesh should be overlapped by a minimum of 100 mm. In addition, diagonal patches of reinforcing mesh (approximately 300 by 200 mm) should be installed at the corners of window/door openings (see Figure 5).

16.19 It is important to ensure that the mesh is free of wrinkles and completely covered. A second 3 mm thick application of basecoat should be applied, to give a total render thickness of 6 mm. The surface of the basecoat should be sponged up smooth to provide a smooth surface for Struc-Sil..

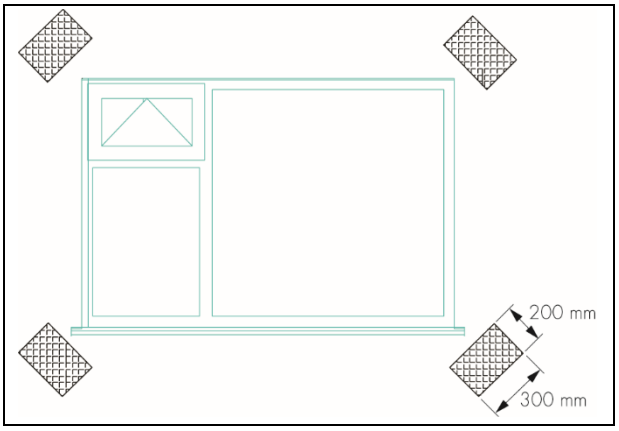
Application of 60-year durability system — mechanical fixings through the reinforcing mesh

16.20 After the slabs are initially fixed to the wall with one fixing per board (see Figure 6), a 3 mm thick application of the basecoat should be applied to the surface of the insulation using a stainless steel trowel or a render pump.

16.21 The reinforcing mesh should be embedded in the wet basecoat using the trowel, and joints should be overlapped by a minimum of 100 mm, and diagonal mesh patches of approximately 300 by 200 mm should be installed at the corners of window/door openings (see Figure 5).

16.22 It is important to ensure that the reinforcing mesh is free of wrinkles and completely covered, and the required minimum thickness of basecoat is achieved.

Figure 5 Additional reinforcement at openings



16.23 Once the mesh is fully embedded in the first layer of basecoat, holes are drilled through the reinforcing mesh and slabs into the substrate wall to the required depth at the specified frequency, and in a regular pattern of seven fixings per square metre (this includes the 1 fixing per slab through the insulation, see Figure 6). The mechanical fixings are inserted and tapped or screwed firmly into place, securing the reinforcing mesh and slabs to the substrate wall. The fixings are slightly overdriven such that a small depression is created in the render. This can be done immediately while the render is still wet or later when the render has set.

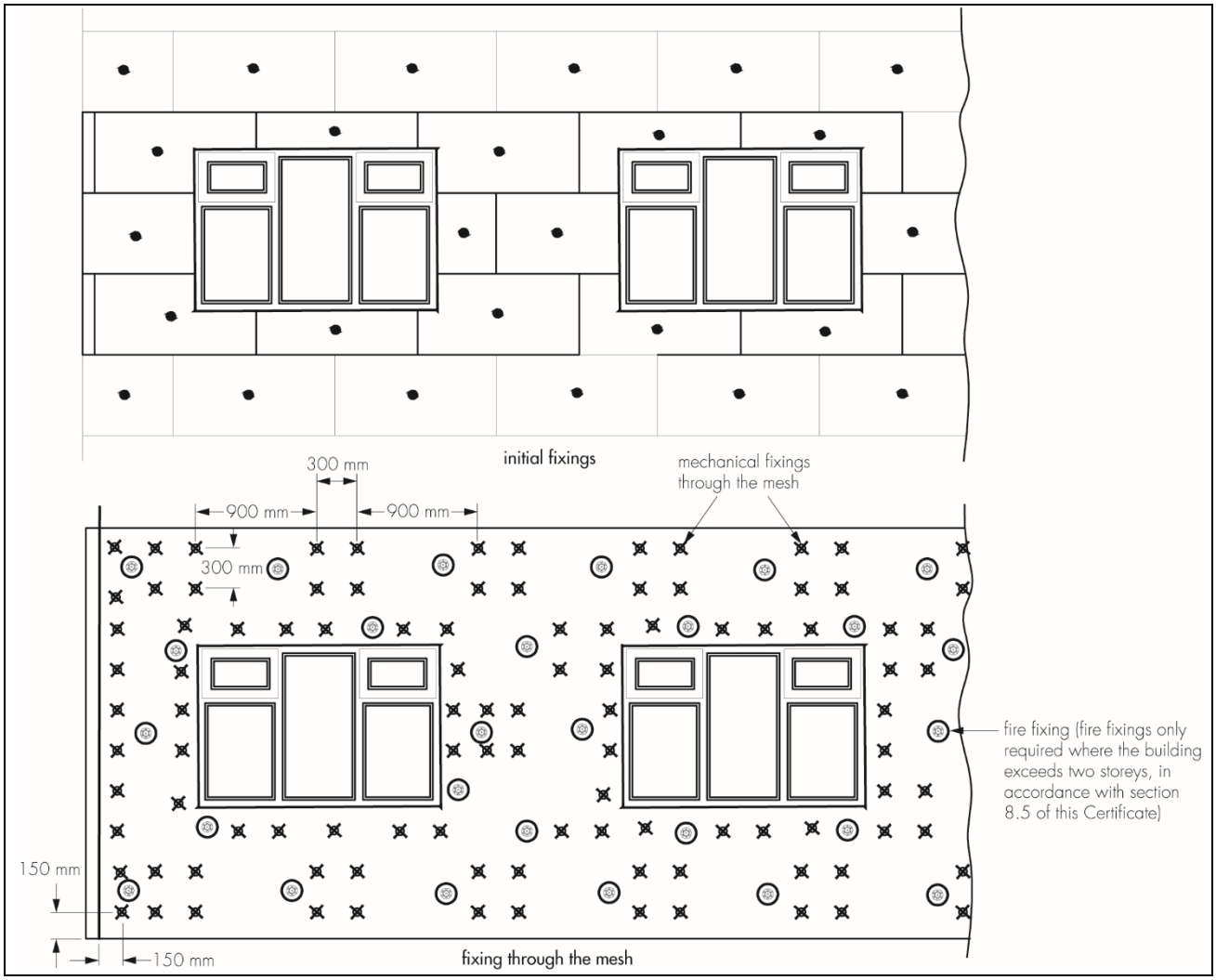
16.24 Stress patches of reinforcing mesh of 150 by 150 mm mesh are applied over the mechanical fixing heads and fully embedded within the basecoat while it is still wet, or alternatively a second layer of mesh can be blanket applied

over the fixings and bedded in with the basecoat. Further basecoat is applied to maintain an approximate 6 mm thickness when measured from the top of the fixings. The surface of the basecoat should be sponged smooth to provide a smooth surface for the Struc-Sil finish. If the building exceeds two storeys, stainless steel fire fixings should then be installed using a pattern that achieves a minimum of 1 fixing per 1 m^2. Refer to Figure 7 for the fixing patterns.

30- and 60-year durability systems

16.25 The basecoat should be left to dry thoroughly. Depending on conditions, the drying time will be approximately 72 hours.

Figure 6 Typical fixing method for 60-year durability



Render finish

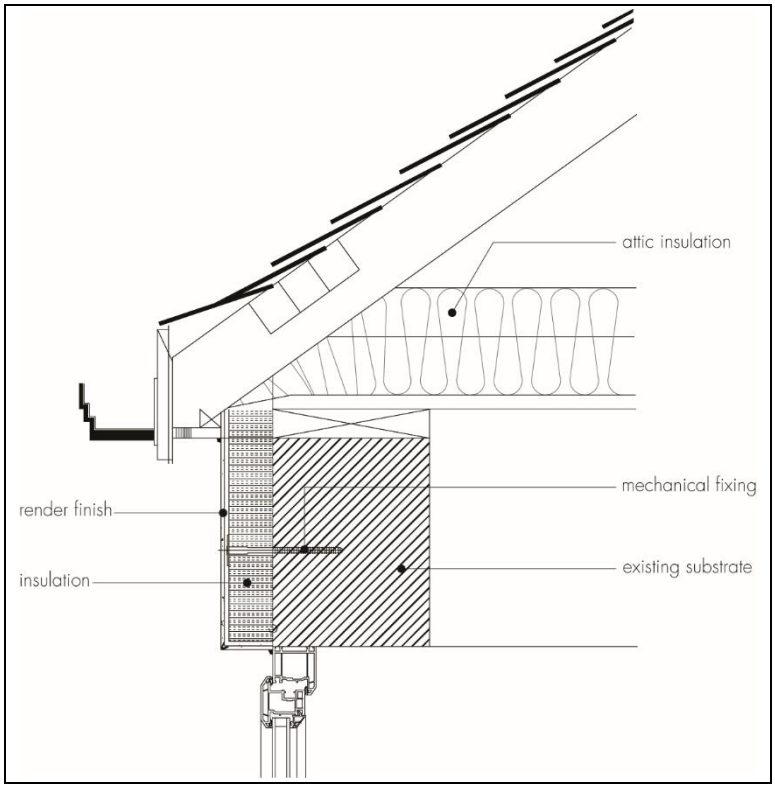
16.26 Before applying the decorative finish, Struc-Primer coat is applied by brush or roller and allowed to dry.

16.27 Struc-Sil is applied in accordance with the Certificate holder's instructions using a stainless steel trowel or spray, in thicknesses from 1.5 to 3 mm.

16.28 Continuous surfaces must be completed without a break, so the coating is always applied to a wet edge.

16.29 At the tops of walls, the system must be protected by a coping, adequate overhang or an adequately sealed, purpose-made flashing (see Figure 7).

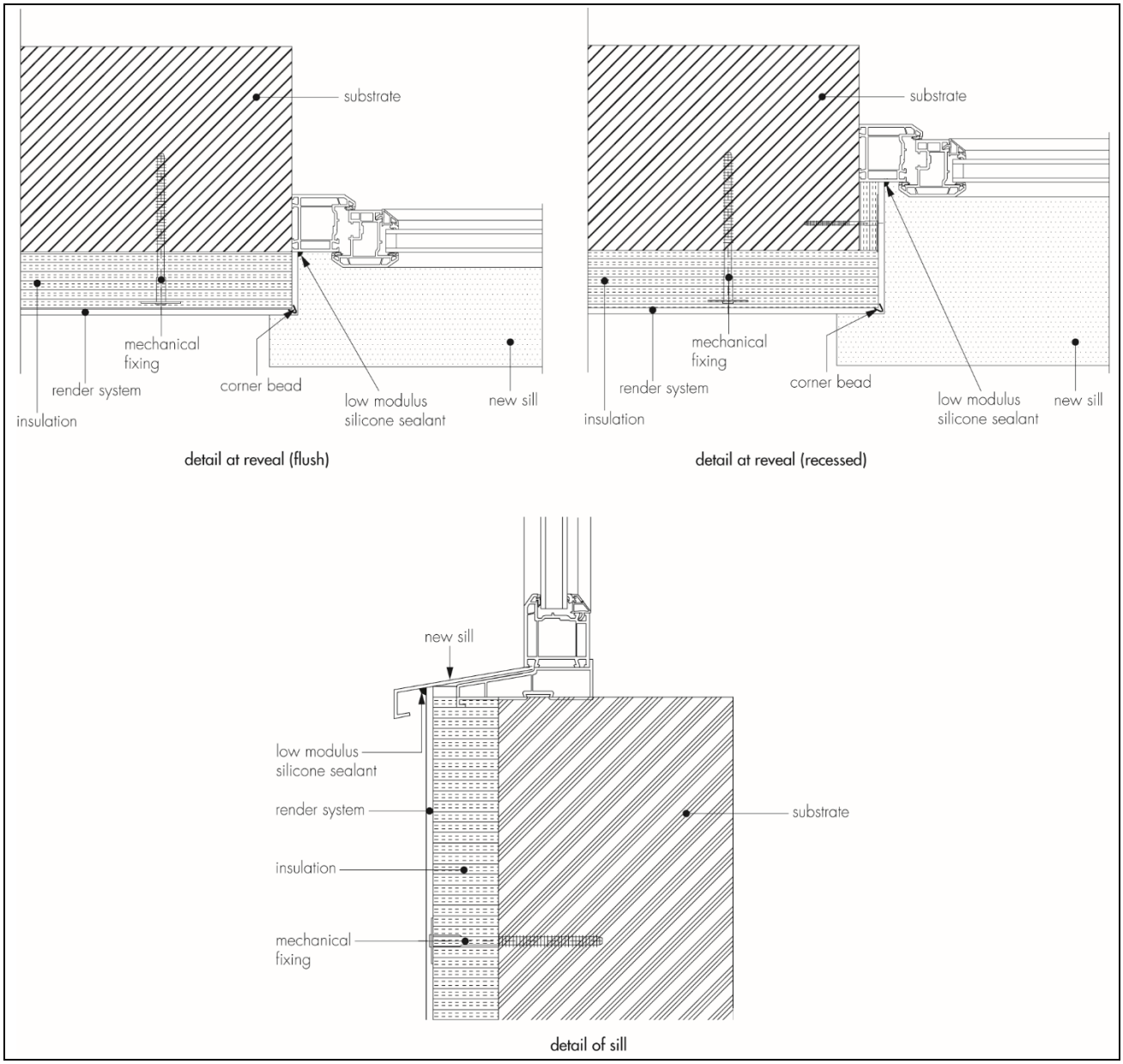
Figure 7 Roof eave detail



16.30 Care must be taken in the detailing of the system around openings and projections (see Figure 8). To achieve 60-year durability, the system is finished against a stainless steel stop bead at reveals, to allow for replacement of windows.

16.31 On completion of the installation, external fittings, eg rainwater goods, are re-fixed through the system into the substrate in accordance with the Certificate holder's instructions.

Figure 8 Typical window reveal detail



Technical Investigations

17 Investigations

17.1 Tests were conducted and the results assessed to determine:

- wind load resistance
- thermal resistance
- fire performance
- pull-through resistance
- hygrothermal performance
- resistance to frost
- resistance to impact
- water absorption (capillary test)
- water vapour permeability.

17.2 An assessment was made of data relating to:

- the risk of interstitial condensation

- thermal conductivity
- durability
- strength and stability.

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

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

Bibliography

BRE Report BR 135 : 2013 *Fire performance of external thermal insulation for walls of multistorey buildings*

BRE Report BR 262 : 2002 *Thermal insulation : avoiding risk*

BRE Report BR 443 : 2006 *Conventions for U-value calculations*

BS 5250 : 2011 + A1 : 2016 *Code of practice for control of condensation in buildings*

BS 8000-0 : 2014 *Workmanship on construction sites — Introduction and general principles*
BS 8000-2.2 : 1990 *Workmanship on building sites. Code of practice for concrete work. Sitework with in situ and precast concrete*
BS 8000-3 : 2001 *Workmanship on building sites — Code of practice for masonry*

BS EN 1990 : 2002 + A1 : 2005 *Eurocode — Basis of structural design*
NA to BS EN 1990 : 2002 + A1 : 2005 UK National Annex to *Eurocode — Basis of structural design*

BS EN 1991-1-4 : 2005 + A1 : 2010 *Eurocode 1 — Actions on structures — General actions — Wind actions*
NA to BS EN 1991-1-4 : 2005 + A1 : 2010 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*
NA + A2 : 14 to BS EN 1992-1-1 : 2004 + A1 : 2014 UK National Annex to *Eurocode 2 — Design of concrete structures — General rules and rules for buildings*

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

BS EN 10088-2 : 2014 *Stainless steel — Technical delivery conditions for sheet/plate and strip of corrosion resisting steels for general purposes*

BS EN 13162 : 2012 + A1 : 2015 *Thermal insulation products for buildings — Factory made mineral wool (MW) products — Specification*

BS EN 13501-1 : 2007 + A1 : 2009 *Fire classification of construction products and building elements —Classification using test data from reaction to fire tests*

BS EN 13914-1 : 2016 *Design, preparation and application of external rendering and internal plastering — External rendering*

BS EN ISO 6946 : 2017 *Building components and building elements — Thermal resistance and thermal transmittance — Calculation method*

BS EN ISO 9001 : 2015 *Quality management systems — Requirements*

BS EN ISO 14001 : 2015 *Environmental management systems — Requirements*

BS OHSAS 18001 : 2007 *Occupational health and safety management systems — Requirements*

EAD 330196-00-0604 *Plastic anchors made of virgin or non-virgin material for fixing of external thermal insulation composite systems with rendering*

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

ETAG 004 : 2013 *Guideline for European Technical Approval of Plastic Anchors for fixing of External Thermal Composite Systems with Rendering*

Conditions of Certificate

Conditions

1. This Certificate:

- relates only to the product 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.

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.

3 This Certificate will be displayed on the BBA website, and the Certificate Holder is entitled to use the Certificate and Certificate logo, provided that the product 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.

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

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

6. Any information relating to the manufacture, supply, installation, use, maintenance and removal of this product which is contained or referred to in this Certificate is the minimum required to be met when the product 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.