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Agrément Certificate
98/3548
Product Sheet 9

DRYVIT EXTERNAL WALL INSULATION SYSTEMS

DRYVIT ROXSULATION PRO EXTERNAL WALL INSULATION SYSTEMS

This Agrément Certificate Product Sheet(1) relates to Dryvit Roxsulation Pro External Wall Insulation Systems, comprising mechanically fixed stone wool insulation slabs, with supplementary adhesive where required, with a reinforced basecoat and render finishes. They are suitable for use on the outside of external walls in new or existing domestic and non-domestic buildings, without height restriction.

(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 systems 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 systems can adequately resist wind loads and impact damage. Mechanical fixings and adhesive both contribute to the wind load resistance for the system specified in section 7.14. For all other systems, the contribution of the adhesive is not considered when calculating resistance to wind load. The resistance to impact is dependent on the configuration of the system (see section 7).

Behaviour in relation to fire — the systems are classified as A2-s1, d0 in accordance with BS EN 13501-1 : 2007 (see section 8).

Risk of condensation — the systems 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 systems will remain effective for at least 30 years (see section 13).

The BBA has awarded this Certificate to the company named above for the systems described herein. These systems have been assessed by the BBA as being fit for their intended use provided they are installed, used and maintained as set out in this Certificate.

On behalf of the British Board of Agrément

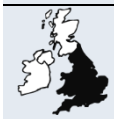
Date of Second issue: 27 April 2021

Originally certificated on 6 January 2020

Hardy Giesler
Chief Executive Officer

Regulations

In the opinion of the BBA, Dryvit Roxsulation Pro External Wall Insulation Systems, 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 systems can sustain and transmit wind loads to the substrate wall. See sections 7.1 to 7.17 of this Certificate.
Requirement:	**B4(1)**	**External fire spread**
Comment:		The systems are unrestricted by this Requirement. See sections 8.1 to 8.4 of this Certificate.
Requirement:	**C2(b)**	**Resistance to moisture**
Comment:		The systems can provide a degree of protection against rain ingress. See section 10.1 of this Certificate.
Requirement:	**C2(c)**	**Resistance to moisture**
Comment:		The systems 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 systems can contribute to satisfying this Requirement. See sections 6.1 and 6.2 of this Certificate.
Regulation:	**7(1)**	**Materials and workmanship**
Comment:		The systems are acceptable. See section 13.1 and the *Installation* part of this Certificate.
Regulation:	**7(2)**	**Materials and workmanship**
Comment:		The systems are unrestricted by this Regulation. See sections 8.1 to 8.4 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 systems can contribute to satisfying these Regulations; however, compensating fabric/services measures may be required. 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 systems can contribute to a construction satisfying this Regulation. See sections 12 and 13.1 and the *Installation* part of this Certificate.
Regulation:	**9**	**Building standards applicable to construction**
Standard:	1.1	Structure
Comment:		The systems can sustain and transmit wind loads to the substrate wall. See sections 7.1 to 7.17 of this Certificate.
Standard:	2.6	Spread to neighbouring buildings
Comment:		The systems are 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 systems are 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 systems can 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 systems can 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 systems 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)], 6.1.6[(1)], 6.1.10[(2)], 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 6.1 to 6.2 of this Certificate.
Standard:	7.1(a)(b)	Statement of sustainability
Comment:		The systems 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 systems 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 systems under Regulation 9, Standards 1 to 6, also apply to this Regulation, with reference to clause 0.12.1[(1)(2)] and Schedule 6[(1)(2)].

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

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

Regulation:	**23**	**Fitness of materials and workmanship**
Comment:		The systems are acceptable. See section 13.1 and the *Installation* part of this Certificate.
Regulation:	**28(b)**	**Resistance to moisture and weather**
Comment:		The systems provide a degree of protection against rain ingress. See section 10.1 of this Certificate.
Regulation:	**29**	**Condensation**
Comment:		The systems can contribute to minimising the risk of interstitial condensation. See section 11.4 of this Certificate.
Regulation:	**30**	**Stability**
Comment:		The systems can sustain and transmit wind loads to the substrate wall. See sections 7.1 to 7.17 of this Certificate.
Regulation:	**36(a)**	**External fire spread**
Comment:		The systems are unrestricted by this Regulation. See sections 8.1 to 8.4 of this Certificate.
Regulation:	**39(a)(i)**	**Condensation measures**
Regulation:	**40**	**Target carbon dioxide emission rate**
Comment:		The systems can contribute to satisfying these Regulations. See sections 6.1 to 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* of this Certificate.

Additional Information

NHBC Standards 2021

In the opinion of the BBA, Dryvit Roxsulation Pro External Wall Insulation Systems, 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 roofs),* Chapter 6.9 *Curtain walling and cladding*.

Technical Specification

1 Description

1.1 Dryvit Roxsulation Pro External Wall Insulation Systems comprise stone wool insulation slabs, which are either mechanically fixed through the insulation (with supplementary adhesive where required) to the substrate wall, or mechanically fixed through the mesh-reinforced basecoat/insulation, with the addition of 40% adhesive.

1.2 For systems fixed through the insulation only, the insulation slabs are primarily fixed with a minimum of five mechanical fixings (and supplementary adhesive where required, ensuring a minimum of 40% coverage)[(1)(2)]. The basecoat is prepared and trowel-applied to the insulation slabs. The reinforcement mesh is immediately positioned into the basecoat and trowelled into position. Additional basecoat is applied to fully embed the mesh.

(1) For dry-fixed systems, the permissible insulation thicknesses are 80 to 120 mm; in addition, the EJOT H1 eco fixing must be used.
(2) For systems which are mechanically fixed and use adhesive (NB minimum 40%), the permissible insulation thicknesses are 80 to 260 mm.

1.3 For systems fixed through the mesh-reinforced basecoat/insulation, the insulation slabs (50 to 260 mm thicknesses) are adhesively fixed (minimum 40% coverage), before the basecoat and reinforcement mesh is applied. While the basecoat is wet, 8.3 fixings per m^2 are applied through the mesh/insulation, followed by the application of mesh patches (minimum 140 x 140 mm) over the fixing heads (with additional basecoat, to ensure they are fully encapsulated); mesh patches are not required when a second layer of reinforcement mesh is used (which is applied immediately to the basecoat and covered with a further coat of basecoat).

1.4 After the basecoat has fully cured, the primer is applied, if required, followed by the finish.

1.5 The system is made up of the following components:

Adhesives

- Dryvit Roxhesive / Dryvit Fibercoat / Dryvit Genesis DM Plus — polymer-modified cementitious powder requiring the addition of 5.5 to 6 litres of clean water per 25 kg bag, applied at a coverage of 3.5 to 8 $kg \cdot m^{-2}$

Insulation

- Dryvit Square Edge Dual Density Stone Wool— comprises slabs of rigid stone wool 1200 by 600 mm in a range of thicknesses between 50 and 250 mm in increments of 10 mm, with a nominal density of 110 $kg \cdot m^{-3}$, a minimum tensile strength perpendicular to the face of 10 $kN \cdot m^{-2}$ and a declared thermal conductivity value (λ_D) of 0.036 $W \cdot m^{-1} \cdot K^{-1}$. Slabs are manufactured to comply with BS EN 13162 : 2012.

- Dryvit Square Edge Single Density Stone Wool— comprises slabs of rigid stone wool 1200 by 600 mm in a range of thicknesses between 50 and 260 mm in increments of 10 mm, with a nominal density of 105 $kg \cdot m^{-3}$, a minimum

tensile strength perpendicular to the face of 10 kN·m^{-2} and a declared thermal conductivity value (λ_D) of 0.036 W·m^{-1}·K^{-1}. Slabs are manufactured to comply with BS EN 13162 : 2012.

- Dryvit Square Edge Single Density HD Stone Wool— comprises slabs of rigid stone wool 1200 by 600 mm in a range of thicknesses between 50 and 200 mm in increments of 10 mm, with a nominal density of 140 kg·m^{-3}, a minimum tensile strength perpendicular to the face of 15 kN·m^{-2} and a declared thermal conductivity value (λ_D) of 0.038 W·m^{-1}·K^{-1}. Slabs are manufactured to comply with BS EN 13162 : 2012.

Mechanical fixings[(1)(2)]

Mechanical fixings — anchors with adequate length to suit the substrate and insulation thickness and selected from:

- EJOT H1 eco — polyethylene with an electro-galvanized pin and a polyamide, PA GF 50 mounting plug[(3)(5)(6)]
- EJOT H4 eco — polyethylene anchor sleeve with an electro-galvanized centre pin (polyamide PA GF 50 mounting plug)[(3)(6)]
- EJOT STR U / EJOT STR U 2G — polyethylene anchor sleeve with a stainless steel or electro-galvanized centre screw[(4)] and an anchor cap made of polystyrene
- Koelner TFIX-8M — polypropylene anchor sleeve with an electro-galvanized centre pin (with a head covering of polyamide PA6)[(3)(6)]
- Koelner TFIX-8S — polypropylene anchor sleeve with an electro-galvanized centre screw (with head covering of polyamide PA6) [(3)(6)]
- LMX-8 / LMX-10 — polyethylene anchor sleeve with an electro-galvanized centre pin[(3)]
- R-TFIX-8S — polyethylene anchor sleeve with a stainless steel or electro-galvanized centre screw, available with or without a polyamide covering[(3)(6)]
- WKTherm ø 8 — polyethylene anchor sleeve with an electro-galvanized centre pin (with head covering of polyamide PA6)[(4)]
- WKTherm S — polyethylene anchor sleeve with an electro-galvanized centre screw[(4)]
- Fischer Thermoz CS 8 — polypropylene anchor sleeve and an insulation plate made of glass fibre-reinforced polyamide (PA 6 GF) with a compound screw consisting of two parts, one made of glass fibre-reinforced polyamide (for the shaft element) and the other of galvanized steel[(3)(6)]
- Bravoll PTH-S — polypropylene anchor sleeve with a stainless steel or electro-galvanized centre screw (with head covering of polyamide)[(4)]
- Bravoll PTH-KZ — polypropylene anchor sleeve with a stainless steel or electro-galvanized centre pin (with head covering of polyamide)[(4)]

(1) Other fixings may be used provided it can be demonstrated that they have equal or higher pull-out strength, plate diameter, plate stiffness and load resistance characteristics to the fixing used for the relevant test (see Section 7 and Tables 4 and 5).
(2) The fixings must be surface mounted only.
(3) Suitable fixings for application where the systems are fixed through minimum 80 mm thick insulation slabs with minimum 40% supplementary adhesive which achieved a design pull-through resistance value of 0.139 KN (see section 7).
(4) Suitable fixings for application where the systems are fixed through minimum 80 mm thick insulation slabs with 40% supplementary adhesive or through the reinforced basecoat with minimum 50 mm thick insulation slabs and 40% adhesive (see section 7).
(5) EJOT H1 eco is the only fixing that can be used for dry-fix systems – see section 7.11 of this Certificate; footnote (1), therefore, does not apply.
(6) Suitable fixings for application where the systems are fixed through minimum 80 mm thick insulation slabs with minimum 40% supplementary adhesive which achieved a design pull-through resistance value of 0.075 KN (see section 7).

Basecoat

Dryvit Fibercoat — a polymer-modified cementitious powder requiring the addition of 5.5 to 6 litres of clean water per 25 kg bag. The basecoat is applied to a thickness of between 3 and 6 mm, at a coverage of approximately 3 to 8 kg·m^{-2}

Reinforcement

Alkali-resistant glass fibre mesh:

- Dryvit Standard Plus 150 — 1 m or 1.22 m wide, with a nominal weight of 150 g·m^{-2} and 3.6 by 4.3 mm grid size
- Dryvit Standard Plus 160 — 1 m wide, with a nominal weight of 160 g·m^{-2} and 3.6 by 3.8 mm grid size
- Dryvit Panzer 260 mesh[(1)]— 1 m wide, with a nominal weight of 260 g·m^{-2} and 6 by 6 mm grid size
- Dryvit Panzer 500 mesh[(1)] — 1.22 m wide, with a nominal weight of 522 g·m^{-2} and 4 by 3.3 mm grid size
- Dryvit Panzer 700 mesh[(1)] — 1.22 m wide, with a nominal weight of 700 g·m^{-2} and 4.3 by 4.3 mm grid size.

(1) Heavy duty mesh which is applied to a maximum height of 2 m.

Primers

- Dryvit Color Prime Plus — a ready-to-use water-based acrylic primer, for use with the acrylic, silicone and silicone-silicate (Hybrid) finishing coats
- Dryvit Demandit Smooth — a ready-to-use water-based acrylic primer, for use with Dryvit Custom Brick Effect finishing coat options (see below)
- Dryvit Wood Prime — a ready-to-use water-based acrylic primer, for use with Drytex Wood Effect

Finishing coats

Mineral

- Dryvit Drytex — polymer-modified mineral finishing coat, requiring the addition of 5 to 6 litres of clean water per 25 kg bag. Available in seven textures, with grain sizes of 3 mm (Sandpebble 3), 2 mm (Quarzputz), 2 mm (Sandpebble 2), 1.6 mm (Sandpebble), 1.2 mm (Quarzputz Fine), 1.2 mm (Sandblast) and 0.6 mm (Freestyle). Applied at a coverage of 1.1 to 3.8 $kg \cdot m^{-2}$
- Dryvit Drytex Wood Effect — polymer-modified mineral finishing coat, requiring the addition of 5.5 to 6.5 litres of clean water per 25 kg bag. Available in grain size 0.5 mm and over coated with the Wood Glaze or Wood Glaze Matt decorative coats. The product is applied to a thickness of between 4 and 5 mm at a coverage of 4.5 to 5 $kg \cdot m^{-2}$

Acrylic

- Dryvit Ameristone — acrylic-based emulsion containing aggregates. Available in grain sizes from 0.8 to 2.5 mm. Applied at a coverage of 3.9 to 4.5 $kg \cdot m^{-2}$
- Dryvit TerraNeo — acrylic-based emulsion containing aggregates and mica. Available in grain sizes from 0.8 to 2.5 mm. Applied at a coverage of 3 to 3.5 $kg \cdot m^{-2}$
- Dryvit Stonemist and Dryvit Stonemist T — acrylic-based emulsions containing aggregates (Dryvit Stonemist T additionally contains mica). Available in grain sizes from 0.6 to 0.8 mm (application thickness 1.6 to 2.5 mm). The products are applied to a thickness of between 1.6 and 2.5 mm at a coverage of 2.6 to 3.5 $kg \cdot m^{-2}$
- Dryvit PMR — acrylic-based emulsion containing aggregates and coalescing and thickening agents. Available in seven textures, with grain sizes of 2 mm (Quarzputz), 2 mm (Sandpebble 2), 1.6 mm (Sandpebble), 1.2 mm (Sandpebble Fine), 1.2 mm (Sandblast), 0.6 mm (Freestyle) and 0.6 mm (Lymestone). Applied at a coverage of 1 to 3.8 $kg \cdot m^{-2}$

Silicone

- Dryvit TR — acrylic-based emulsion containing silicone resin. Available in seven textures, with grain sizes of 2 mm (Quarzputz), 2 mm (Sandpebble 2), 1.6 mm (Sandpebble), 1.2 mm (Sandpebble Fine), 1.2 mm (Sandblast), 0.6 mm (Freestyle) and 0.6 mm (Lymestone). Applied at a coverage of 1 to 3.8 $kg \cdot m^{-2}$
- Dryvit HDP — silicone emulsion with hydrophobic additives and aggregates. Available with a grain size of 1.6 mm (Sandpebble). Applied at a coverage of 2.6 to 2.8 $kg \cdot m^{-2}$

Silicone-silicate

- Dryvit Hybrid — silicate-silicone-acrylic based emulsion. Available in seven textures, with grain sizes of 2 mm (Sandpebble 2), 1.5 mm (Sandpebble), 1.2 mm (Quarzputz Fine), 1.2 mm (Sandpebble Fine), 1.2 mm (Sandblast), 0.6 mm (Freestyle) and 0.6 mm (Lymestone). Applied at a coverage of 1 to 3.8 $kg \cdot m^{-2}$

Custom Brick Effect(1)

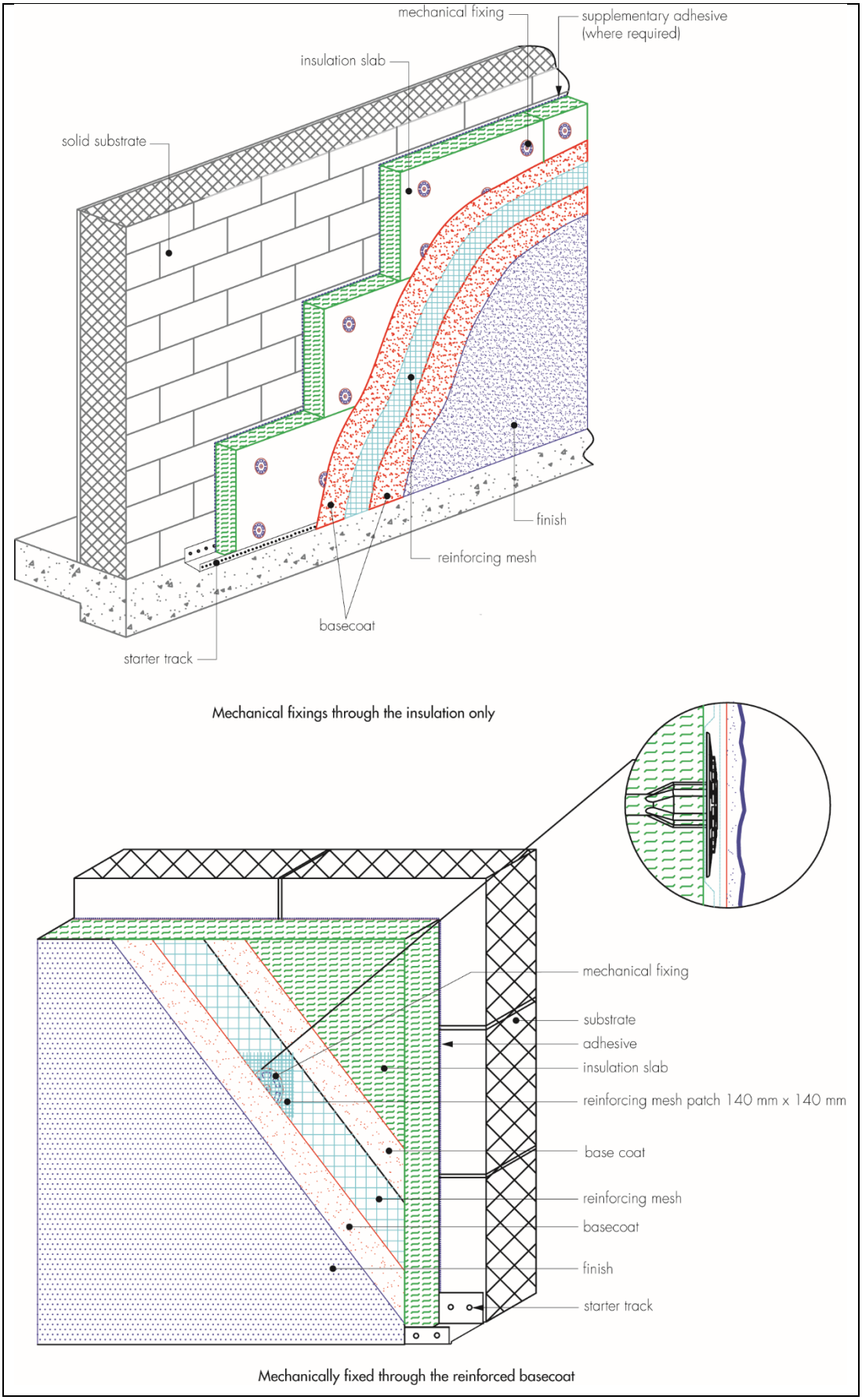
- Dryvit Custom Brick — acrylic-based emulsion. Available with a grain size of 0.6 mm. Applied at a coverage rate of 1.2 to 2 $kg \cdot m^{-2}$ over Demandit Smooth with self-adhesive cardboard template to form a Custom Brick Effect.

(1) Ameristone, TerraNeo, Stonemist and Stonemist T can also be used to form a Custom Brick Effect.

Decorative coats

- Dryvit Demandit Smooth — an acrylic emulsion, available in a range of colours, for use with mineral finishing coats excluding Dryvit Drytex Wood Effect
- Dryvit Silstar / Silstar Pro — a silicone resin emulsion, available in a range of colours, for use with mineral finishing coats excluding Dryvit Drytex Wood Effect
- Dryvit HyDroPhobic — a silicone resin emulsion with hydrophobic additives, available in a range of colours, for use with mineral finishing coats excluding Dryvit Drytex Wood Effect
- Dryvit Wood Glaze and Dryvit Wood Glaze Matt — acrylic emulsions, available in a range of colours, for use with the Dryvit Drytex Wood Effect finishing coat.

Figure 1 Dryvit Roxsulation Pro External Wall Insulation Systems



1.6 Ancillary materials used with the system:

- Aluminium or PVC-U profiles, comprising:
  — starter track
  — edge, corner bead with mesh, movement and render stop profiles
  — frame seal beads with mesh
  — connector profile and fixings.

1.7 Ancillary materials also used with the system but outside the scope of this Certificate:

- fungicidal wash
- silicone sealant
- expanding PU foam
- compressible seals
- close cell backer rods
- extruded polystyrene insulation boards (for use under the dpc level)
- stainless steel mechanical fixing.

2 Manufacture

2.1 The components for use with the systems are either 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.

2.3 The management system of the manufacturer has been assessed and registered as meeting the requirements of BS EN ISO 9001 : 2015 by Centrum Certyfikacji Jakości (Certificate 24/S/2018).

3 Delivery and site handling

3.1 The insulation slabs are delivered in sealed packs, with the product identification and manufacturer's 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

Component	Quantity and packaging
Dryvit Roxhesive (adhesive) Dryvit Fibercoat (adhesive/basecoat) Dryvit Genesis DM Plus (adhesive) Dryvit Drytex (finishing coat) Dryvit Drytex Wood Effect (finishing coat)	25 kg bags
Dryvit Stonemist (finishing coat) Dryvit Stonemist T (finishing coat)	23 kg pails
Dryvit PMR (finishing coat) Dryvit HDP (finishing coat) Dryvit TR (finishing coat) Dryvit Hybrid (finishing coat) Custom Brick (finishing coat)	24.72 kg pails
Dryvit Ameristone (finishing coat)	24 kg pails
Dryvit TerraNeo (finishing coat)	22 kg pails
Dryvit Color Prime Plus (primer) Dryvit Demandit Smooth (primer and decorative coat) Dryvit Wood Prime (primer) Dryvit Silstar / Silstar Pro (decorative coat) Dryvit HyDroPhobic (decorative coat)	17.36 kg pails
Dryvit Wood Glaze and Dryvit Wood Glaze Matt (decorative coat)	12.7 or 3.17 kg pails
Dryvit Standard Plus 150 mesh	Rolls, 1 m wide by 50 m length Rolls, 1.22 m wide by 45.7 m length
Standard Plus 160 mesh	Rolls, 1 m wide by 50 m length
Dryvit Panzer 260 mesh	Rolls, 1 m wide by 50 m length
Dryvit Panzer 500 mesh	Rolls, 1.22 m wide by 22.9 m length
Dryvit Panzer 700 mesh	Rolls, 1.22 m wide by 22.9 m length
Mechanical fixings	Boxed by manufacturer
Stone Wool Insulation	Wrapped in plastic film

3.3 The insulation slabs must be kept dry and should be stored on a firm, clean, level base, off the ground and under cover until required for use. Care must be taken during handling to avoid damage.

3.4 The slabs should be protected from exposure to moisture and water, either by storing opened packs under cover or re-covering with polythene sheeting.

3.5 The powder adhesives and mineral renders must be stored in dry conditions, off the ground and protected from moisture. Contaminated materials should be discarded.

3.6 The primers and finishes must be stored in tightly closed original packaging in cool, dry conditions and protected from excessive heat and frost.

Assessment and Technical Investigations

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

Design Considerations

4 General

4.1 Dryvit Roxsulation Pro External Wall Insulation Systems, when installed in accordance with this Certificate, are satisfactory for use in reducing the thermal transmittance (U value) of external masonry or concrete walls of new or 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 systems (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 systems are 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 restriction. Prior to the installation of the systems, wall surfaces should comply with section 14.

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 8000-0 : 2014
- BS 8000-2.2 : 1990
- BS 8000-3 : 2001
- PD 6697 : 2019.

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 systems in line with existing expansion joints in the building structure and in accordance with the Certificate holder's recommendations for the specific installation.

4.7 The systems will improve the weather resistance of a wall and provide a decorative finish. However, for existing buildings, they 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 systems 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 systems 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 systems. 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 systems are installed and maintained in accordance with the conditions set out in this Certificate.

5 Practicability of installation

The systems should only be installed by specialist contractors who have successfully undergone training and registration by the Certificate holder (see section 15).

Note: The BBA operates a UKAS-accredited Approved Installer Scheme for external wall insulation (non-mandatory); 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 declared thermal conductivity (λ_D) values of the insulations given in Table 2.

Table 2 Thermal conductivity of the insulation (λ_D value)

Insulation type	Thickness (mm)	Thermal conductivity ($W \cdot m^{-1} \cdot K^{-1}$)
Dryvit Square Edge Dual Density Stone Wool	50 to 250	0.036
Dryvit Square Edge Single Density Stone Wool	50 to 260	0.036
Dryvit Square Edge Single Density HD Stone Wool	50 to 200	0.038

6.2 The U value of a completed wall will depend on the insulation type and 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 Table 2.

Table 3 Insulation thickness required to achieve design U values[1][2][3] given in the national Building Regulations

U value ($W \cdot m^{-2} \cdot K^{-1}$)	**Thickness of insulation (mm)**			
	215 mm brickwork, $\lambda = 0.56\ W \cdot m^{-1} \cdot K^{-1}$		**200 mm dense blockwork, $\lambda = 1.75\ W \cdot m^{-1} \cdot K^{-1}$**	
	Dual Density or Single Density Stone Wool[4] 0.036 $W \cdot m^{-1} \cdot K^{-1}$	Single Density HD Stone Wool 0.038 $W \cdot m^{-1} \cdot K^{-1}$	Dual Density or Single Density Stone Wool[4] 0.036 $W \cdot m^{-1} \cdot K^{-1}$	Single Density HD Stone Wool 0.038 $W \cdot m^{-1} \cdot K^{-1}$
0.18	200	—[5]	210	—[5]
0.19	190	200	190	200
0.25	130	140	140	150
0.26	130	140	140	140
0.28	120	120	130	130
0.30	110	110	120	120
0.35	90	90	100	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 ($\lambda = 0.88\ W \cdot m^{-1} \cdot K^{-1}$). Declared thermal conductivity (λ_D) value of the insulation is as shown in section 6.1. An adhesive layer, 5 mm thick with $\lambda = 1\ W \cdot m^{-1} \cdot K^{-1}$ covering 40% of the area is also included, and a slab emissivity of 0.9, together with an external render thickness of 5 mm with $\lambda = 1\ W \cdot m^{-1} \cdot K^{-1}$.

(2) Calculations based on a system that included 8.3 fixings per square metre with a point thermal transmittance (X_p) of 0.002 $W \cdot K^{-1}$. Use of other types of fixings should be calculated in accordance with BS EN ISO 6946 : 2017. A gap correction ($\Delta U''$) of zero is assumed.

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

(4) When applying the maximum available insulation thickness, these walls can achieve a U value of 0.15 $W \cdot m^{-2} \cdot K^{-1}$.

(5) See section 4.2.

6.3 Care must be taken in the overall design and construction of the systems, particularly at the 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 systems and it is the responsibility of the company installing the systems 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 systems 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 systems, 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 systems are applied. Any defects should be made good prior to the systems 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 systems.

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

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

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

Mechanically fixed, with or without supplementary adhesive, through insulation

Primary resistance mechanisms:[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 the insulation only, 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 10 $kN \cdot m^{-2}$ for Dual Density Stone Wool and Single Density Stone Wool, and 15 $kN \cdot m^{-2}$ for Single Density HD Stone Wool. 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 : 2018 (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 5.

(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
EJOT H1 eco	11/0192	Concrete C12/15 Clay bricks	8	25	0.9	2
EJOT H4 eco	11/0192	Concrete C12/15 Clay bricks	8	25[3]	0.5 0.75	2
EJOT STR U	04/0023	Concrete C12/15 Clay bricks	8	25[3]	1.5	2
EJOT STR U 2G	04/0023	Concrete C12/15 Clay bricks	8	25[3]	1.5	2
Koelner TFIX-8M	07/0336	Concrete C12/15 Clay bricks	8	25	1.2	2
Koelner TFIX-8S	11/0144	Concrete C12/15 Clay bricks	8	25[3]	1.2	2
R-TFIX-8S	17/0161	Concrete C12/15 Clay bricks	8	25[3]	1.2 1.5	2
LMX-8	16/0509	Concrete C12/15 Clay bricks	8	25[3]	0.5 0.75	2
LMX-10	16/0509	Concrete C12/15 Clay bricks	8	30[3]	0.75 0.9	2
WKTherm ø 8	11/0232	Concrete C12/15 Clay bricks	8	25	1.2 1.5	2
WKTherm S	13/0724	Concrete C12/15 Clay bricks	8	25[3]	1.2 1.5	2
Fischer Termoz CS 8	14/0372	Concrete C12/15 Clay bricks	8	45[3]	1.5 1.2	2
Bravoll PTH-S	08/0267	Concrete C12/15 Clay bricks	8	25[3][4]	1.5	2
Bravoll PTH-KZ	05/0055	Concrete C12/15 Clay bricks	8	25[3]	0.7 0.9	2

(1) The minimum values for plate stiffness of fixings of 0.6 kN·mm^{-1} and anchor plate load resistance of 2.08 kN, relate to the fixings which achieved a maximum design wind load resistance of 3.96 kN·m^{-2} and which were used for the DWU test. The minimum anchor plate stiffness of 0.5 kN·mm^{-1} and anchor plate load resistance of 1.02 kN, relate to the fixings used for the pull-through test which achieved a design pull-through resistance value of 0.139 KN (see Table 5). The minimum anchor plate stiffness of 0.6 kN·mm^{-1} and anchor plate load resistance of 1.4 kN, relate to the fixings used for the pull-through test which achieved a design pull-through resistance value of 0.075 KN (see Table 5).

(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.

(3) The fixing ETA references the effective anchorage depth for other substrates.

(4) Value quoted relates to the overall embedment depth (h_{nom}).

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 80 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)	Dryvit Square Edge Dual Density Stone Wool		Dryvit Square Edge Single Density Stone Wool and Dryvit Square Edge Single Density HD Stone Wool	
	pull-through			
Tensile resistance of the insulation ($kN \cdot m^{-2}$)	10		10 and 15 (HD Slab)	
Fixing type[1]	EJOT H1 eco, EJOT H4 eco, EJOT STR U 2G, EJOT STR U, Koelner TFIX-8M, Koelner TFIX-8S, LMX-10, LMX-8, R-TFIX-8S, WKTherm ø 8, WKTherm S, Fischer Thermoz CS 8, Bravoll PTH-S, Bravoll PTH-KZ		EJOT H1 eco, EJOT H4 eco, EJOT STR U 2G, EJOT STR U, Koelner TFIX-8M, Koelner TFIX-8S, R-TFIX-8S, WKTherm ø 8, WKTherm S, Fischer Thermoz CS 8, Bravoll PTH-S, Bravoll PTH-KZ	
Fixing plate diameter (mm)	60		60	
Insulation thickness (mm)	80		80	
Characteristic pull-through resistance[2] per fixing kN	Panel joints	—	Panel joints	—
	At panel	0.347	At panel	0.187
Partial factor[3]	2.5		2.5	
Design pull-through resistance per fixing (N_{RD3}) kN	Panel joints	—	Panel joints	—
	At panel	0.139	At panel	0.075
Design pull-through resistance per slab kN (based on the minimum number of fixings)[4]	0.695		0.375	
Design pull-through resistance per slab kN (based on maximum number of fixings)[5]	1.112		0.6	

(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 per slab (1200 x 600 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 and minimum insulation thickness as specified in this 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 8 fixings per slab (1200 x 600 mm), which equates to approximately 11 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 this 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 systems, 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 fix installations (ie with no supplementary adhesive) correctly designed in accordance with this Certificate, will safely accommodate the applied loads due to the self-weight of the system, wind and impact when using insulation with a maximum thickness of 120 mm, any render system and EJOT H1 eco fixings. Installations with 40% supplementary adhesive can safely accommodate such loads for all material combinations covered by this Certificate.

7.12 The data obtained from sections 7.7 to 7.9 must be assessed against the design wind load and the following expression must be satisfied.

For safe design:

$Rd \geq W_e$
$Rd_{b.ins.rend} = A_r * N_{RD1}$
$Rd_{pull\text{-}out} = n * N_{RD2}$
$Rd_{pull\text{-}through} = (N_{RD3panel} * n_{panel}) + (N_{RD3joint} * n_{joint})/A_{slab}$

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_{slab}	is the area of the slab (m^2).

7.13 The insulation systems are mechanically fixed to the substrate wall with 5 fixings per slab (1200 by 600 mm) or approximately 7 fixings per metre square, as per the fixing pattern shown in Figure 5, and in conjunction with a minimum 40% coverage of supplementary adhesive where required (see sections 1.2 and 16). Additional fixings may be required, depending on the results of the calculations detailed above for the specific site.

Mechanically fixed, with adhesive, through mesh/insulation[(1)(2)]

Primary resistance mechanisms:

- 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
- the bond between the substrate and adhesive interface[(3)] (see section 7.15).

(1) For mechanically fixed systems with adhesive, fixed through the mesh/insulation, the resistance of the system to negative wind load is obtained from the Dynamic Wind Uplift (DWU) test.
(2) Further guidance is available from BBA Guidance Note 1, available on the BBA website (www.bbacerts.co.uk).
(3) The percentage of adhesive coverage should be considered.

7.14 The DWU test was carried out on a Dryvit Roxsulation Pro External Wall Insulation System mechanically fixed onto a masonry substrate. Insulation slabs were initially fixed with 8.3 fixings per m^2 (EJOT STR U fixings) applied through the reinforced basecoat/insulation and 40% adhesive, before the render finish was applied. The maximum characteristic negative wind load resistance that can be sustained by the system as determined from the DWU test is 5.94 $kN \cdot m^{-2}$. The maximum design wind load resistance (Rd_{Test}) is derived by dividing the maximum characteristic wind load resistance by a partial safety factor of 1.5 and equals 3.96 $kN \cdot m^{-2}$ [(1)(2)(3)(4)(5)].

(1) The maximum design wind load that can be resisted by the systems corresponds to the maximum allowed spacing, centres and layout of fixings. This fixing configuration with the appropriate fixings will also adequately transfer the systems self-weight, wind and impact loads to a suitable substrate wall.
(2) Minimum coverage area of adhesive is 40%
(3) The partial factor for the DWU test 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 the DWU test by a partial safety factor of 1.5.
(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 (≥ 2.08 kN) characteristics.

7.15 The characteristic bond resistance between the substrate and the adhesive derived from test results was 250 kN·m^{-2}.(1)(2)(3) The design resistance of the bond between the substrate and the adhesive (N_{RD4}) should be taken as the characteristic resistance divided by a partial factor of 9.

(1) The bond between the substrate and the adhesive from the test should have a minimum failure resistance of 250 kN·m^{-2} after the adhesive has fully cured and in dry conditions, in accordance with ETAG 004 : 2013. The minimum failure resistance value is based on a minimum 28 day curing time of the test sample.
(2) The results from tests carried out on site for the bond (while the adhesive is curing) between the substrate and the adhesive, should be at least equal to 80 kN·m^{-2}.
(3) The minimum bonded surface area (A_{min}) should be at least 40%.

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

For safe design:

$R_{dTest} \geq W_e$ and $n_{RD2} \geq W_e$ and $Rd_{b.sub.adh} \geq W_e$

Where:

R_{dTest}	is the design negative wind load resistance of the system based on test (kN.m^{-2})
W_e	is the maximum design wind load (kN·m^{-2})
n_{RD2}	is the design pull-out resistance of the system and is based on characteristic values from site tests; the number of fixings per unit area must be ≥ as tested in the DWU test
A_{min}	is the minimum bonded surface area (based on % area covered)
N_{RD4}	is the design bond resistance between the substrate and adhesive based on tests (kN·m^{-2})
$Rd_{b.sub.adh} = A_{min} * N_{RD4}$	is the design bond resistance between the substrate and adhesive (kN·m^{-2})

7.17 The insulation systems are mechanically fixed through mesh/insulation to the substrate wall with a minimum of 8.3 fixings per square metre, as per the fixing pattern shown in Figure 6, and in conjunction with a minimum 40% coverage of adhesive (see section 16). The design wind load resistance is only applicable to the system tested and as described in 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

7.18 Hard body impact tests were carried out in accordance with ETAG 004 : 2013. The systems are suitable for use in the Use Categories up to and including those specified in Table 6 of this Certificate.

Table 6 Impact resistance of systems

Render systems: **Dryvit Fibercoat basecoat with** **primer + finishing coats + decorative coats, as indicated below:**	**Particle size (mm)**	**Category[(1)]**
		Any single mesh
Mineral finishing coats Drytex + Demandit Smooth	0.6 to 3	I
Mineral finishing coats Drytex + Silstar / Silstar Pro	0.6 to 3	I
Mineral finishing coats Drytex + Hydrophobic	0.6 to 3	I
Mineral finishing coat Drytex Wood Effect + Wood Prime + Wood Glaze	0.5	II
Mineral finishing coat Drytex Wood Effect + Wood Prime + Wood Glaze Matt	0.5	II
Color Prime Plus + Ameristone, TerraNeo, Stonemist or Stonemist T	0.6 to 2.5	I
Color Prime Plus + Acrylic finishing coats PMR	0.6 to 2	II
Color Prime Plus + Silicone finishing coats TR	0.6 to 2	II
Color Prime Plus + Silicone finishing coats HDP	1.6	II
Color Prime Plus + Silicone-silicate finishing coats Hybrid	0.6 to 2	II
Demandit Smooth + Custom Brick Effect using Ameristone, TerraNeo, Stonemist and Stonemist T	0.6 to 2.5	I
Demandit Smooth + Custom Brick Effect using Custom Brick	0.6	II

- 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.

7.19 For high impact zones susceptible to damage (ie 2 m from ground level), the installation of Dryvit Panzer mesh is recommended.

8 Behaviour in relation to fire

8.1 The reaction to fire classification for the systems in accordance with BS EN 13501-1 : 2007 is A2-s1, d0[(1)].

(1) Institute of Ceramics and Building Materials Test Report Numbers 151/18/SG/N

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

8.3 The insulation materials in isolation are classified A1 to BS EN 13501-1 : 2007.

8.4 The systems are not subject to any restriction on building height or proximity to boundaries.

8.5 For application to second storey walls and above, it is recommended that the designer considers 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, cavity barriers, 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 systems will provide a degree of protection against water ingress. However, care should be taken to ensure that walls are adequately watertight prior to application of the systems. The systems 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 water ingress.

10.3 The guidance given in BRE Report BR 262 : 2002 should be followed in connection with the watertightness 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 top of walls, the systems should be protected by an adequate coping, overhang or other detail designed for use with these types of systems (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 penetrations at junctions between the insulation systems 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 Annex G, and BRE Report BR 262 : 2002.

Interstitial condensation

11.4 Walls incorporating the systems 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 Table 6.

11.5 The water vapour resistance (μ) factor (for the insulation slabs) and equivalent air layer thickness (s_d) (for the render systems) is shown in Table 7.

Table 7 Water vapour resistance factor and equivalent air layer thickness

	S_d (m)	(μ)
Stone wool insulation thickness 50 to 260 mm	—	1[(1)]
Rendering systems : 6 mm thick Fibercoat basecoat with primer + finishing coats (specific particle size) + decorative coats, as indicated below		
Mineral finishing coats Drytex (particle size 3 mm) + Demandit Smooth	0.4	—
Mineral finishing coats Drytex (particle size 3 mm) + Silstar / Silstar Pro	0.4	—
Mineral finishing coats Drytex (particle size 3 mm) + HyDroPhobic	0.4	—
Mineral finishing coat Drytex Wood Effect (application thickness 5 mm) + Wood Prime + Wood Glaze	0.4	—
Mineral finishing coat Drytex Wood Effect (application thickness 5 mm) + Wood Prime + Wood Glaze Matt	0.4	—
Color Prime Plus + Ameristone, TerraNeo, Stonemist or Stonemist T (application thickness 2.5 mm)	0.5	—
Color Prime Plus + Acrylic finishing coats PMR (particle size 2 mm)	0.5	—
Color Prime Plus + Silicone finishing coats TR (particle size 2 mm)	0.5	—
Color Prime Plus + Silicone finishing coats HDP (particle size 1.6 mm)	0.4	—
Color Prime Plus + Silicone-silicate finishing coats HYBRID (particle size 2 mm)	0.5	—
Demandit Smooth + Custom Brick Effect using Ameristone, TerraNeo, Stonemist and Stonemist T (application thickness 2.5 mm)	0.3	—
Demandit Smooth + Custom Brick Effect using Custom Brick (application thickness 2 mm)	0.3	—

(1) Obtained from BS EN ISO 10456 : 2007, Table 4.

12 Maintenance

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 insulation 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.

13 Durability

13.1 The systems will have a service life of at least 30 years, provided any damage to the surface finish is repaired immediately and regular maintenance is undertaken, as described in section 12.

13.2 The basecoat and finishes containing cement 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. Any lime bloom on the base coat layer must be removed prior to applying the primer or finish.

13.3 The finishes and coatings 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, fungicidal treatment or, if required, by over coating, provided the coating does not adversely affect the water vapour transmission or fire characteristics of the systems. The advice of the Certificate holder should be sought as to the suitability of a particular product.

13.4 To maintain a high quality aesthetic appearance, it may be necessary to periodically overcoat the building using a compatible Dryvit 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 treatment and the need for any necessary repairs to the building structure before application of the systems. A specification is prepared for each elevation of the building indicating:

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

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, and to determine the bond strength between the adhesive and the substrate for site installations which are based on the specification in section 7.14 of this Certificate. 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 or the wind uplift test data and pull-out resistance (see section 7) and to demonstrate that the bond strength between the adhesive and the substrate is adequate (see section 7.15).

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 insulation 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 a minimum of 40 mm beyond the finished face of the systems. New buildings should incorporate suitably deep sills.

14.6 In new buildings, internal wet work (eg screed or plastering) should be completed and allowed to dry prior to the application of the systems.

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

15 Approved installers

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

- employing operatives who have been trained and approved by the Certificate holder to install the systems
- 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 systems 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. If exposure to frost is likely or in damp/wet conditions, the render must be protected. The systems should not be applied at temperatures below 5°C or above 25°C, except for the following:

- Dryvit Demandit Smooth, Dryvit Stone Mist, Dryvit Stone Mist T and Dryvit Silstar Pro should only be applied at temperatures from 7°C to 25°C
- Dryvit Ameristone and Dryvit TerraNeo should only be applied at temperatures from 10°C to 25°C.

16.3 The planarity of the substrate must be checked, and any protrusions exceeding 10 mm removed.

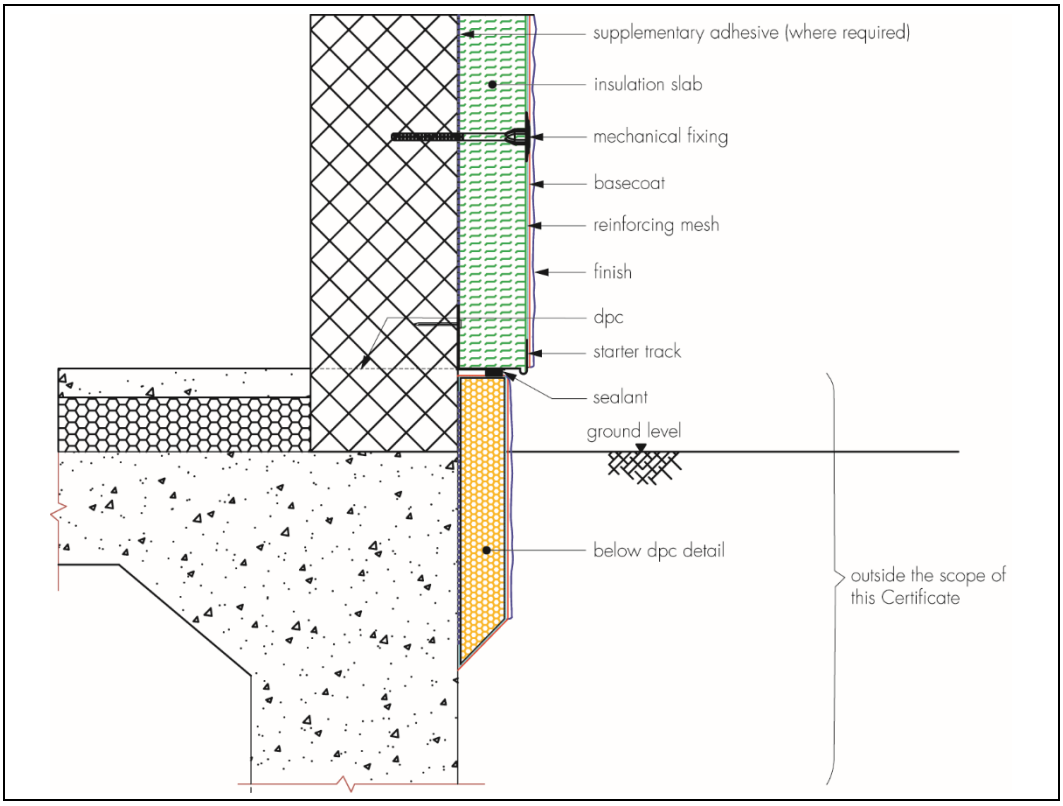
16.4 All rendering should be in accordance with the relevant recommendations of BS EN 13914-1 : 2016.

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

Positioning and securing insulation slabs

16.6 The starter track is secured to the external wall above the dpc using mechanical fixings at a minimum of 300 mm centres. Profiles and expansion joints are fitted as specified (see Figure 2).

Figure 2 Typical section of base profile



16.7 Where specified, the adhesive is mixed in a suitable container using potable water and a high-power drill and paddle to create a paste-like mortar, ensuring there are no lumps in the mixed material in accordance with the Certificate holder's instructions (see section 1.2). The material must rest for 5 minutes before being mixed again to the required consistency. The adhesive is optional for certain systems which are fixed through the insulation only (see section 1.2) and mandatory when the system is mechanically fixed through the reinforced basecoat (see section 1.3).

Two methods of adhesive application can be used. For the ribbon and dab method, a ribbon of adhesive (50 mm wide and 10 mm thick) is applied around the perimeter of the insulation slab. Eight adhesive dabs (100 mm in diameter and 10 mm thick) are positioned at approximately 200 mm centres to the interior area of the insulation slab, to ensure a minimum of 40% adhesive contact area can be achieved with the substrate. For the notched trowel method, adhesive is applied vertically using a notched trowel to achieve ribbons spaced 10 mm wide and 13 mm deep, and at a maximum of 45 mm centres.

16.8 The first run of insulation slabs is positioned on the starter track and pressed firmly against the wall. Care should be taken to ensure that all insulation slab edges are butted tightly together, and alignment is checked as work proceeds (to achieve a flush finish).

16.9 Subsequent rows of slabs are positioned so that the vertical slab joints are staggered at the building corners and all board joints overlap by a minimum of 200 mm (see Figure 5).

16.10 Gaps between 1.5 and 7 mm must be filled with expanding polyurethane foam; gaps greater than 7 mm must be filled with strips of the insulation material.

16.11 To fit around details such as doors and windows, insulation slabs may be cut with a sharp knife or a fine-tooth saw. At penetrations, the slabs should be cut in an 'L' shape and aligned so that the slab edges (vertical and horizontal joints) do not coincide with the corners of the opening. Purpose-made window sills designed to prevent water ingress and incorporating drips to shed water clear of the system, are also fitted.

16.12 At all locations where there is a risk of insulant exposure (eg window reveals or eaves), the systems must be protected, eg by a minimum 40 mm adequate overhang or by purpose-made sub-sills, seals or flashing.

16.13 Building corners, door and window heads and jambs are formed using corner beads with mesh, in accordance with the Certificate holder’s instructions. Alternatively, where corner beads are not specified, the reinforcement mesh must be continuous at corners and must not be lapped within 200 mm of a building corner.

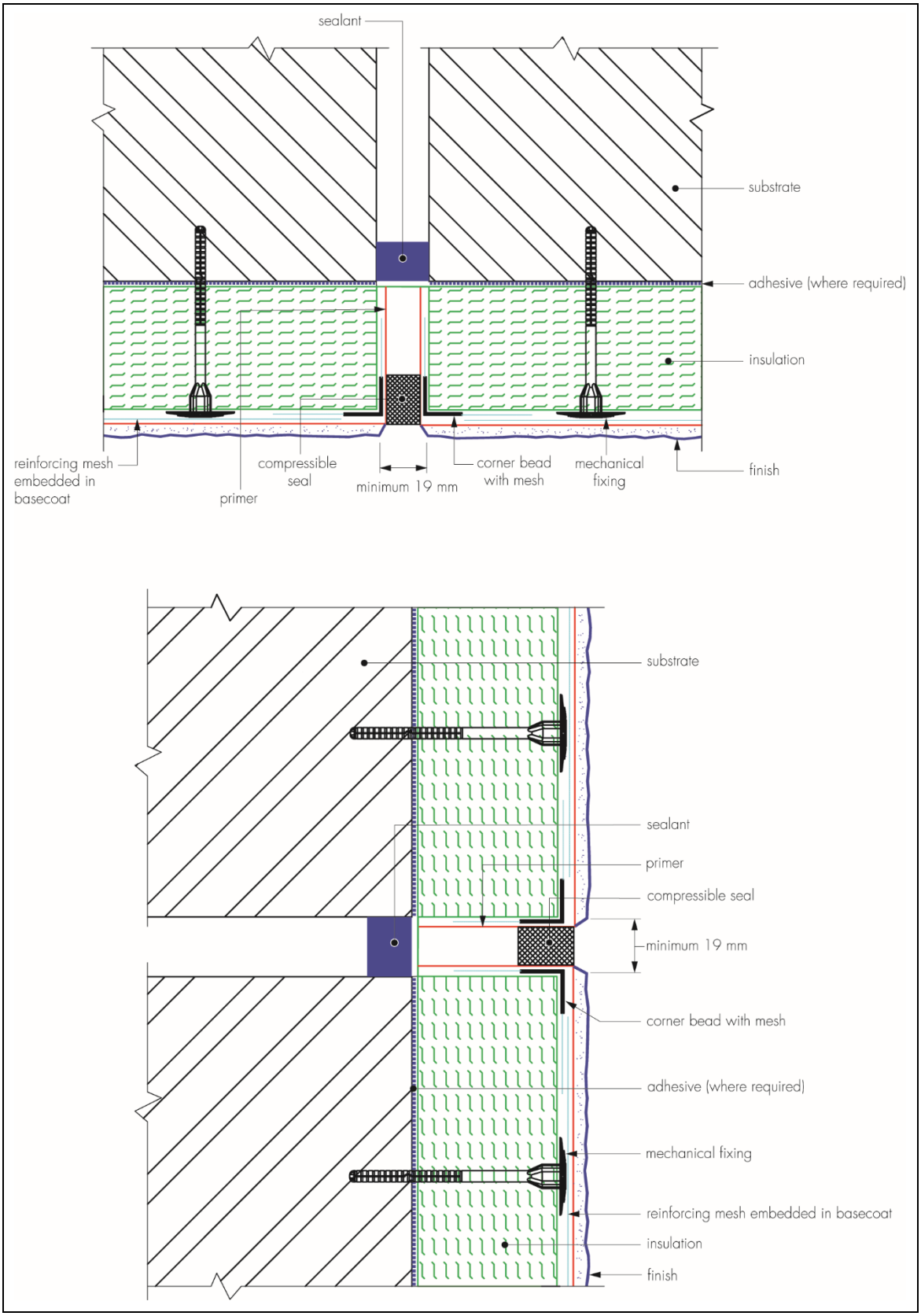
16.14 Installation continues until the whole wall is completely covered including, where appropriate, the building soffits.

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

Movement joints

16.16 Movement joints should be incorporated where specified. Existing structural expansion joints should be extended through to the surface of the insulation systems (see Figure 3).

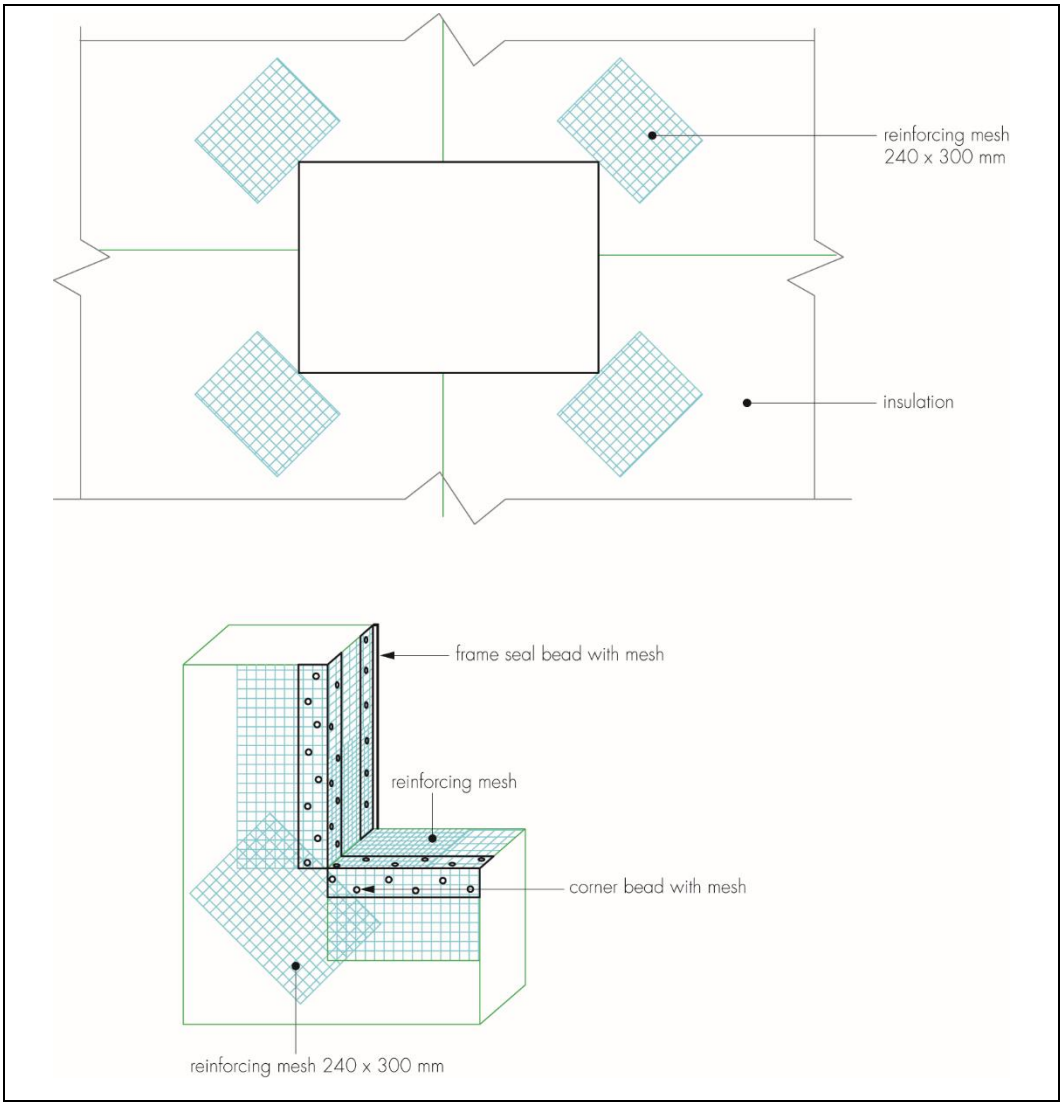
Figure 3 Example movement joint detail (horizontal and vertical)



16.17 Prior to the application of the render coat, the frame seal beads and other relevant seals are positioned and installed at all openings (eg windows and doors), overhanging eaves, gas and electric meter boxes, wall vents or where the render abuts any other building material or surface.

16.18 To provide the necessary reinforcement, stress patches of reinforcement mesh (approximate size 240 by 300 mm) are applied with basecoat, diagonally over the insulation slabs at the corners of openings (see Figure 4).

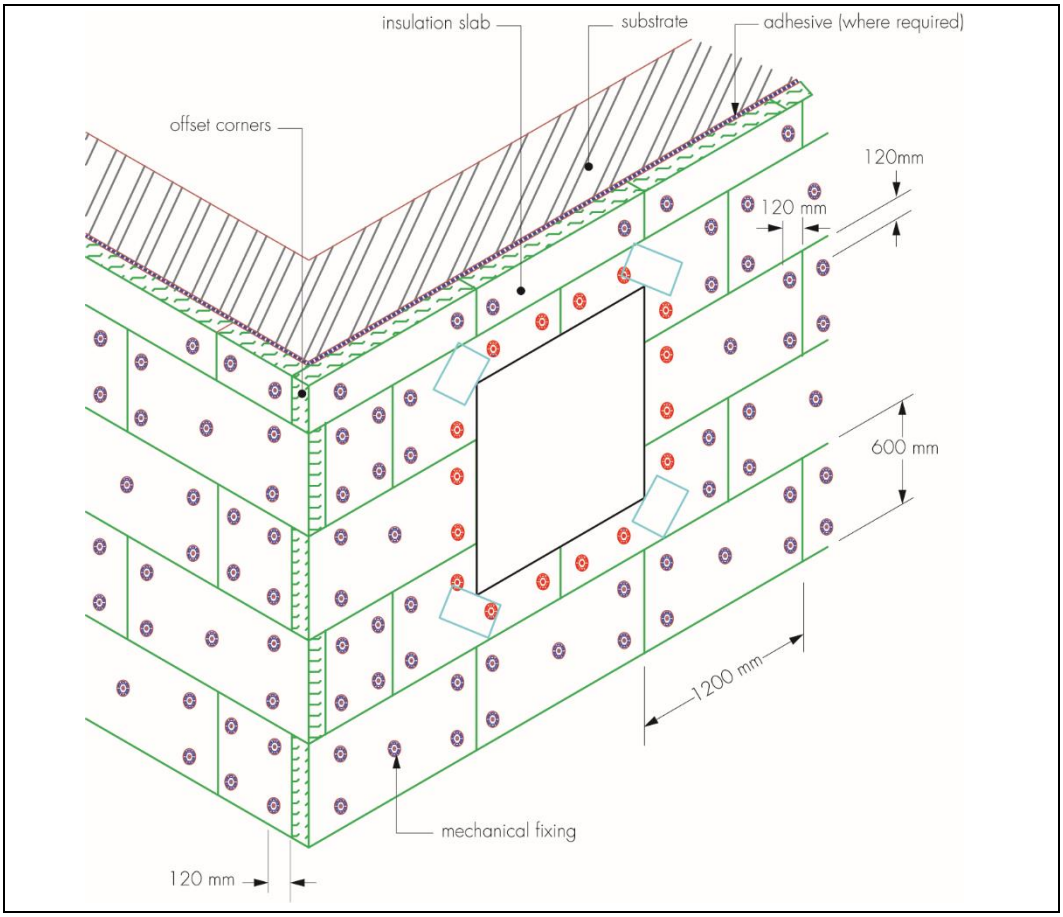
Figure 4 Additional reinforcement at openings



Application — mechanical fixings through the insulation

16.19 Details of mechanical fixings (including their arrangement in the insulation slabs) must be specified in the project-specific design requirements based on pull-out test results, substrate type and wind loading data. A minimum of 7 fixings per m^2 should be installed, unless otherwise specified in the project-specific design (see Figure 5). If required, extra fixings can be applied at the edge zones to satisfy the wind load conditions. Holes are drilled into the substrate through the insulation, and the fixings are installed, fixing tightly to the insulation slab using the dedicated driving system to ensure there is no risk of pull-off. If adhesive is used, application of the mechanical fixings should begin at least 24 hours after the insulation slabs have been adhesively fixed and, in all situations, after the adhesive has hardened. Care must be taken to ensure that the fixings are not overdriven.

Figure 5 Insulation slab fixing pattern – through the insulation only



16.20 After sufficient stabilisation of the installed insulation (normally 24 hours when adhesive is used), during which time the insulation should be protected from exposure to extreme weather conditions to prevent degradation, the wall is ready for the application of the basecoat. The stone wool must be kept dry throughout the installation process.

16.21 The basecoat is prepared as described previously for the adhesive (see section 16.7). Using a steel trowel, a skim coat of basecoat is applied over the entire surface of the insulation slabs, followed by a further coat applied using an angled 8 mm notched trowel, to achieve a uniform thickness of approximately 2 to 3 mm once trowelled flat. The reinforcement mesh is applied and immediately embedded into the basecoat, ensuring the mesh is overlapped at joints by a minimum of 100 mm. A second layer of basecoat (1 to 2 mm thick, approximately) is applied, to obtain a smooth and uniform surface of approximately 3 to 5 mm overall thickness.

16.22 In situations where the Panzer mesh (heavy duty mesh) is required, a skim coat of basecoat is applied with a steel trowel over the entire surface of the insulation slabs, followed by a further layer of basecoat, to a uniform thickness of approximately 2 to 3 mm so that the Panzer mesh is embedded. The mesh should not be overlapped but fitted with closely butted joints. The drying period for the basecoat will depend on weather conditions; however, the basecoat (with embedded mesh) should be allowed to dry for at least 24 hours. Dryvit Standard Plus Mesh should then be applied in the manner described in section 16.21.

Application — mechanical fixings through the reinforced basecoat/insulation

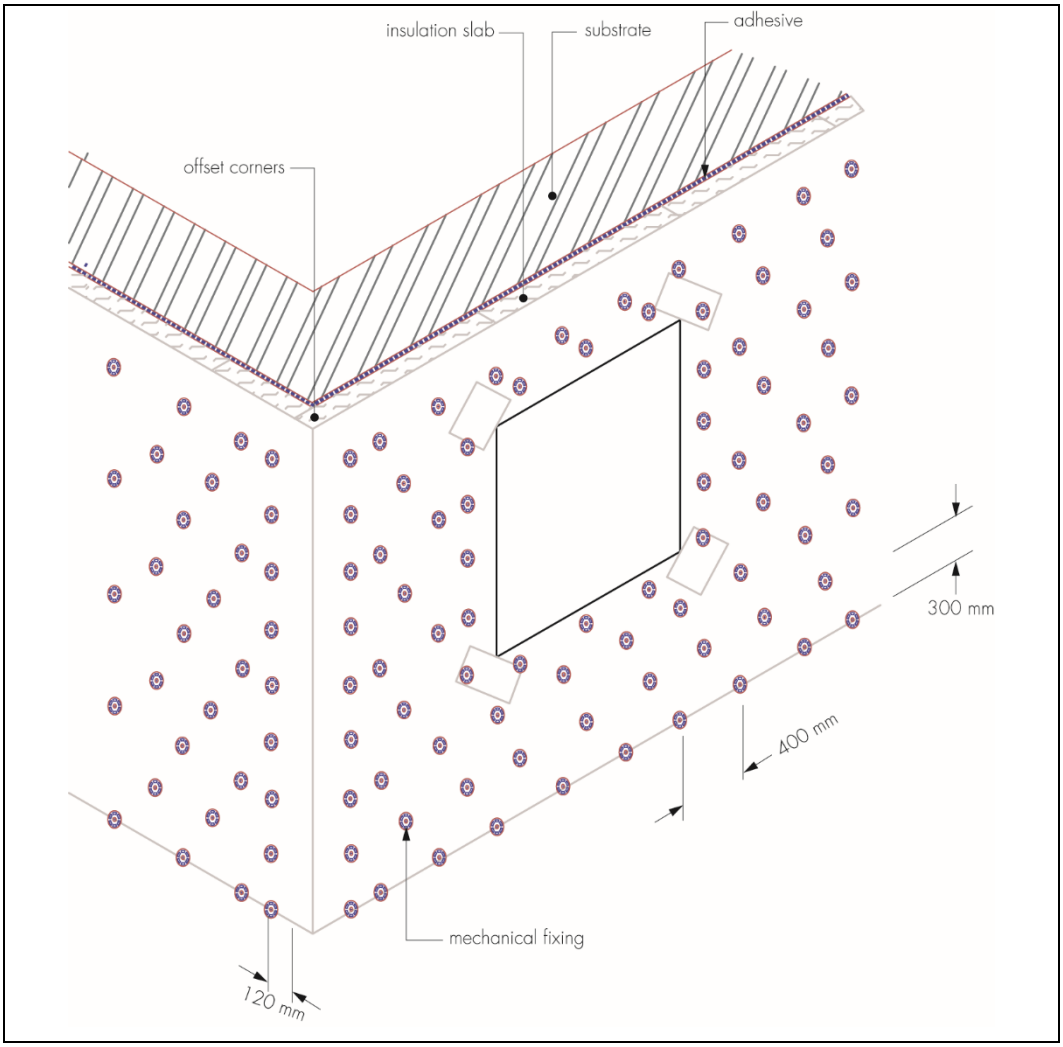
16.23 After the insulation adhesive has set, the system is ready for the application of basecoat and reinforcement mesh.

16.24 A skim coat of basecoat is applied over the entire surface of insulation slabs, followed by a further coat using an angled 8 mm notched trowel, to a uniform flat thickness of approximately 3 mm. The reinforcement mesh is applied and immediately embedded into the basecoat, ensuring the mesh is overlapped at joints by a minimum of 100 mm.

16.25 It is important to ensure that the mesh is free of wrinkles, completely embedded in the base coat and that the required minimum thickness of basecoat is achieved.

16.26 While the basecoat is still wet, holes are drilled through the reinforced basecoat and insulation slabs into the substrate wall to the required depth at the specified frequency and pattern, but not less than 8.3 fixings per square metre (See Figure 6). Around openings, additional fixings should be used. The mechanical fixings are inserted and tapped or screwed firmly into place, securing the reinforced basecoat and insulation slabs to the substrate wall. The fixing plate is deliberately slightly over-driven into the basecoat to reduce protrusion of the fixing head. Suitable plugs are placed over the screw or pin to fill any recess in the plastic washer head.

Figure 6 Insulation slab fixing pattern – through the reinforced basecoat/insulation



Mesh patches

16.27 While the basecoat is still wet, the heads of the fixings are coated with additional basecoat and 140 by 140 mm stress patches of reinforcement mesh are applied over the mechanical fixing heads and fully embedded within the basecoat. Once the first coat has partially dried (between 1 and 4 hours), a second coat (approximately 2 to 3 mm thick) is applied to obtain a smooth and uniform surface of approximately 5 to 6 mm overall thickness. The fixing head must be covered with a minimum 3 mm thickness of basecoat.

Full second layer of mesh

16.28 Alternatively, where a full second layer of mesh is specified, mesh patches are not required; instead, once the first coat of basecoat has partially dried (between 1 and 4 hours), a second coat is applied using a notched trowel and a full layer of mesh is applied and embedded in the basecoat (2 to 3 mm thick). The basecoat is levelled to obtain a smooth and uniform surface. The total base coat layer should give an approximately 5 to 6 mm overall thickness. The fixing head must be covered with a minimum 3 mm thickness of basecoat.

Rendering and finishing

16.29 The basecoat must be allowed to dry/cure (24 to 48 hours) before application of the primer/finish coat. Where specified, primers (see section 1.1 for list of primers and their compatibility with the finishing coats) must be allowed to dry in accordance with the Certificate instructions. The drying time is dependent on ambient conditions, but will typically be 4 hours for Dryvit Color Prime Plus, Dryvit Wood Prime and Dryvit Demandit Smooth. After the primer is dry but prior to the application of the finishing coat, sealant or compressible seals should be applied as required, as defined in the project-specific site package in accordance with the Certificate holder's instructions.

16.30 The finishes and decorative coats are then applied, using the methods described for the specific finishing coats.

Dryvit Stonemist and Dryvit Stonemist T

16.31 An initial skim coat is applied, using a stainless steel trowel. A second coat is then applied to the wet initial coat with a suitable spray machine (the Certificate holder can advise on suitable equipment). Alternatively, to achieve a flatter texture finish, the product may be applied with a stainless steel trowel.

Dryvit Ameristone

16.32 The product is applied in two passes (one horizontally, one vertically) to achieve a uniform finish, with a suitable spray machine.

Dryvit TerraNeo

16.33 The product is applied with a steel trowel, to an approximate 1.6 to 2.5 mm thickness. The surface is lightly floated using a plastic float, in a tight figure 8 pattern. Floating over the finish lightly several times will bring the large mica flakes to the surface and enhance the granite appearance.

Dryvit Drytex Wood Effect

16.34 The Dryvit Drytex Wood Effect render is applied to the required thickness (see section 1.1), using an 8 to 10 mm notched trowel to create a smooth finish, and is left to dry for approximately 20 to 30 minutes. The imprint surface of a Dryvit Wood Mould is coated with a clean food-grade cooking oil and gently pressed onto the surface of the render, and then pressed with a 150 mm rubber roller to create the desired wood effect. The mould is immediately removed, and the process repeated until the entire wall area is covered. After 24 hours, shallow grooves are cut between the wood-effect imprints using a handheld narrow-bladed electric precision mini circular saw, to create the panel effect. The render is left to dry for a minimum of 48 hours; any oil is removed with a warm mild detergent before applying the Wood Prime with a suitable roller. Once the primer has dried, two coats of Dryvit Wood Glaze or Dryvit Wood Glaze Matt are applied using a suitable brush.

Dryvit Custom Brick Effect

16.35 The process entails coating the basecoat with Dryvit Demandit Smooth to create a mortar joint effect and then applying a self-adhesive cardboard template over it, and then the selected finishing coat, to form the brick effect. The acrylic finish is applied with a stainless steel trowel flush with the top surface of the template. An impressed texture appearance may be developed on the surface of the freshly applied acrylic finish by using a textured roller. Once dry, the template is removed to reveal the mortar joints. The cardboard template is for single use only; it provides joints of 10 mm width. The surface area of the joints must be less than 30%.

Other textured finishes

16.36 The other finishes are applied to the required thicknesses (see section 1.1 *Finishing coats*) using a stainless steel trowel and finished with a plastic float to create the desired finish. The drying time is dependent on conditions. Dryvit Drytex is overcoated with Dryvit Demandit Smooth, Dryvit Silstar / Silstar Pro or the Dryvit HyDroPhobic decorative coat using a brush, roller or a suitable spray machine.

16.37 Care should be taken in the detailing of the systems around features such as openings, projections and at eaves (see Figures 7 to 10) to ensure adequate protection against water ingress and to limit the risk of water penetrating the system.

16.38 The systems should be allowed to dry thoroughly before painting any of the surrounding features.

16.39 At the top of walls, the systems must be protected by a coping, adequate overhang or adequately sealed, purpose-made flashing.

Figure 7 Typical roof eaves detail

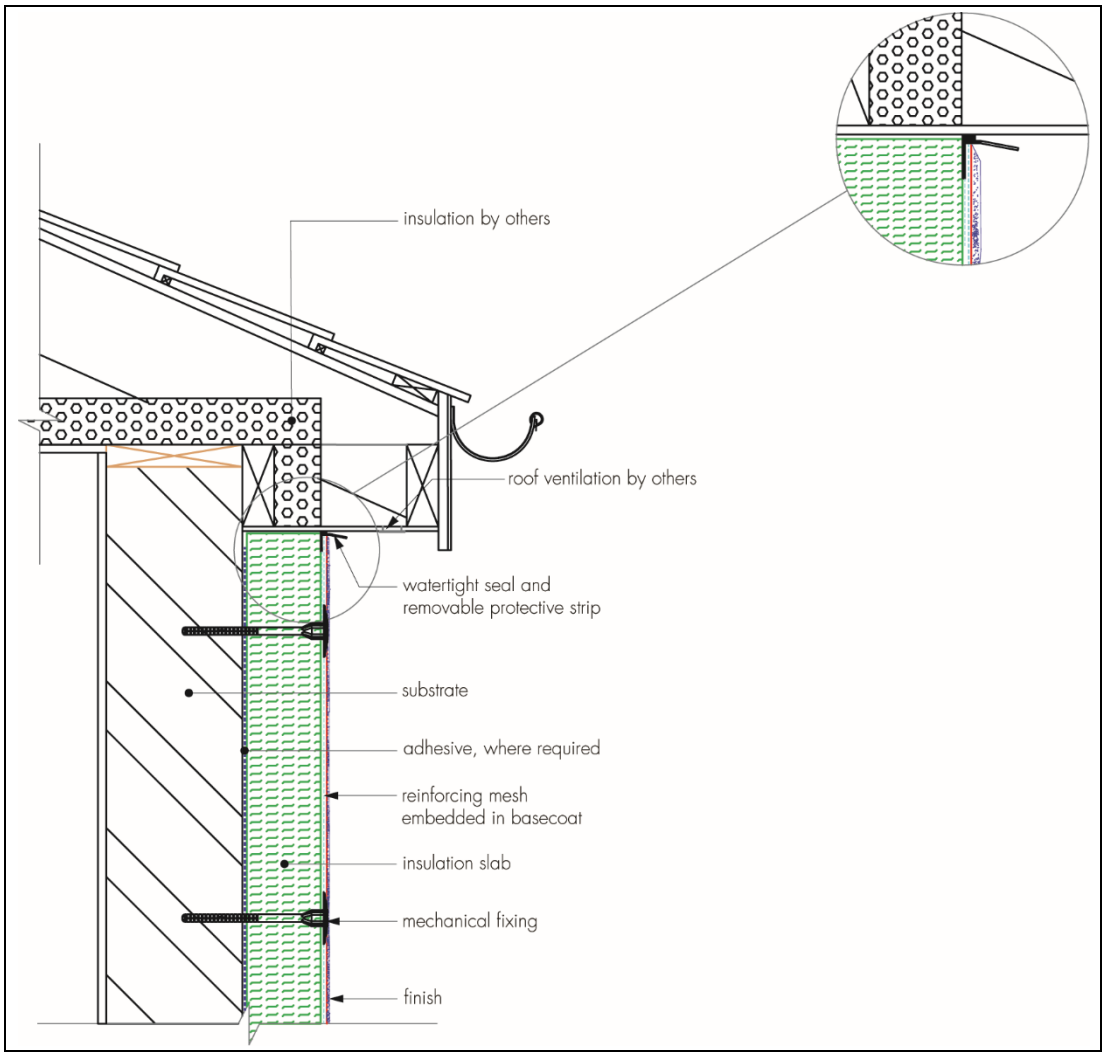


Figure 8 Insulated reveal detail

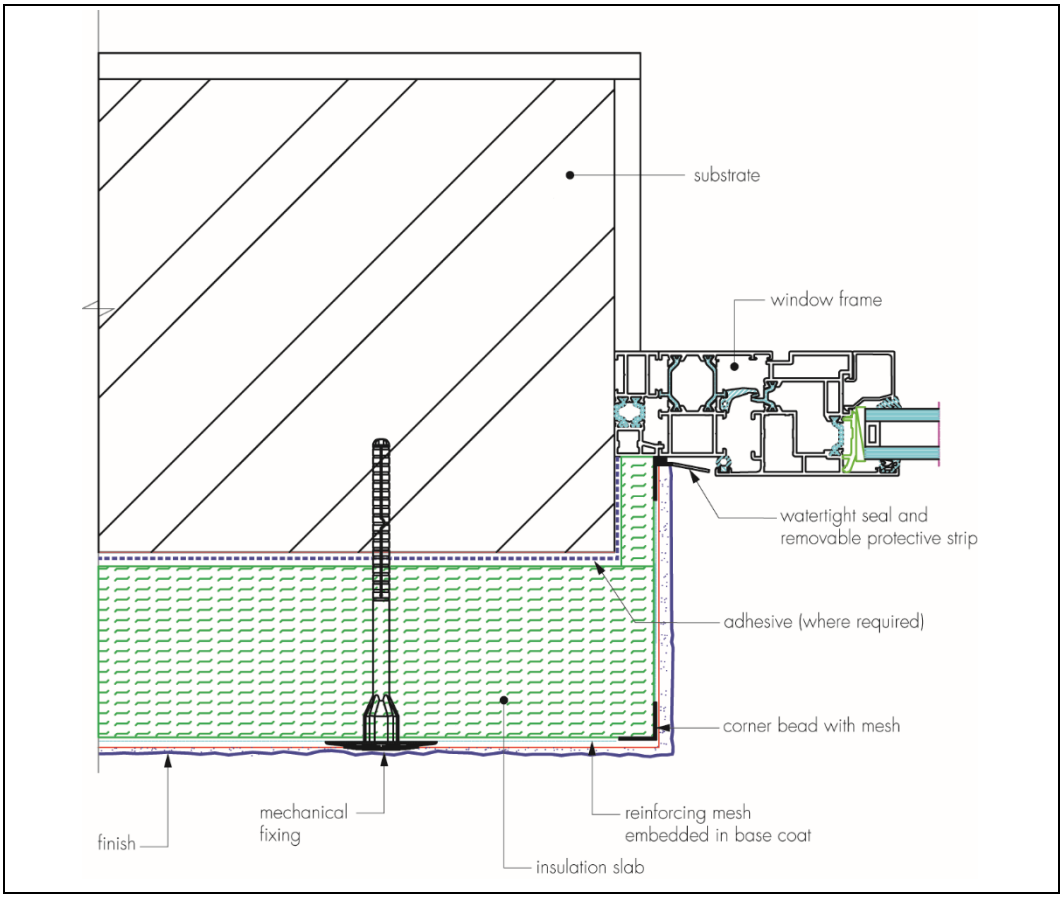


Figure 9 Insulated window head detail

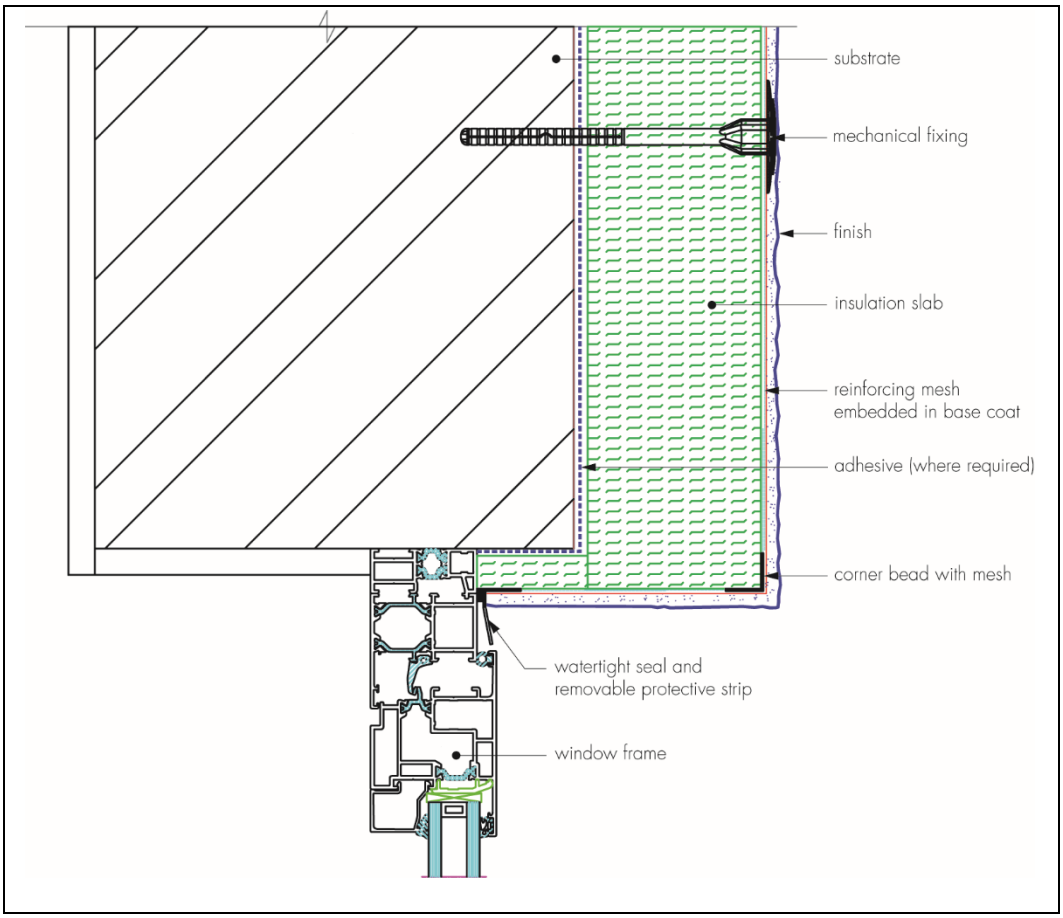
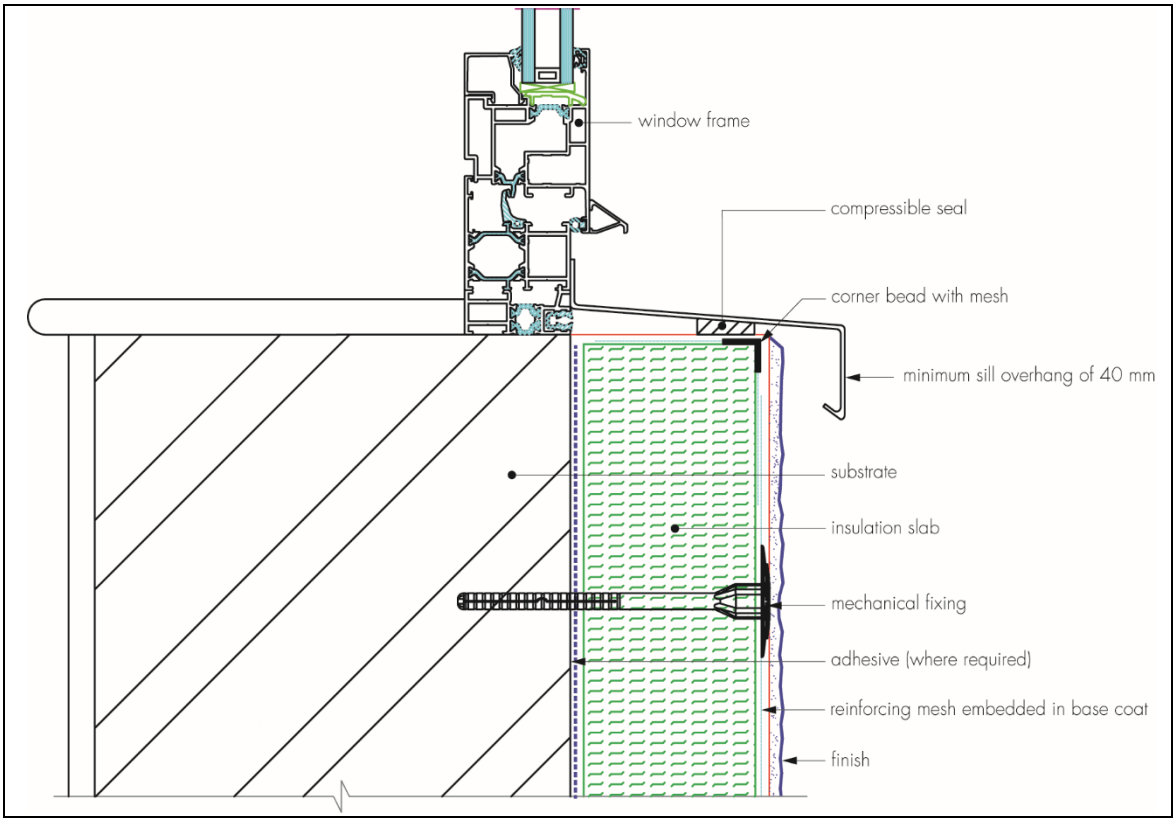


Figure 10 Window sill detail



Technical Investigations

17 Tests

An examination was made of data relating to:

- component characterisation
- water vapour permeability
- water absorption
- bond strength
- reaction to fire
- durability of finish coatings
- heat/spray cycling
- dynamic wind uplift test
- impact resistance.

18 Investigations

18.1 An examination was made of data relating to:

- reaction to fire performance of the systems
- thermal conductivity and the risk of interstitial condensation
- component characterisation
- durability of finishing coats
- component characterisation
- strength and stability of the systems, including wind load.

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

18.3 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.

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19 Conditions

19.1 This Certificate:

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

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

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

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

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

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

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

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

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