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BBA APPROVAL INSPECTION TESTING CERTIFICATION
TECHNICAL APPROVALS FOR CONSTRUCTION

Agrément Certificate
03/4022
Product Sheet 1

STRUCTHERM STRUCTURAL EXTERNAL WALL INSULATION SYSTEMS

STRUCTHERM STRUCTURAL EPS/XPS/PHENOLIC/PIR EXTERNAL WALL INSULATION SYSTEMS FOR SOLID WALL STRUCTURES

This Agrément Certificate Product Sheet(1) relates to the Structherm Structural EPS/XPS/Phenolic/PIR External Wall Insulation Systems for Solid Wall Structures, comprising standard expanded polystyrene (EPS), enhanced EPS, extruded polystyrene (XPS), phenolic or polyisocyanurate (PIR) insulation in a mechanically-fixed galvanized or stainless steel cage, and render and brick-slip finishes. The systems are suitable for use on the outside of walls of new and existing domestic and non-domestic buildings.

(1) Hereinafter referred to as 'Certificate'.

CERTIFICATION INCLUDES:

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

KEY FACTORS ASSESSED

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

Strength and stability — correctly designed systems will adequately resist wind loads and impact damage (see section 7).

Behaviour in relation to fire — the systems have a B-s1, d0 or a Class 0/'low risk' reaction to fire classification, depending on the finish chosen (see section 8).

Risk of condensation — the systems can contribute to limiting the risk of surface and interstitial 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 First issue: 21 July 2014

Originally certificated on 6 February 2004

John Albon — Head of Approvals
Energy and Ventilation

Claire Curtis-Thomas
Chief Executive

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

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

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Regulations

In the opinion of the BBA, the Structherm Structural EPS/XPS/Phenolic/PIR External Wall Insulation Systems for Solid Wall Structures, if installed, used and maintained in accordance with this Certificate, will 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. See section 7.4 of this Certificate.
Requirement:	B4(1)	External fire spread
Comment:		The systems can satisfy this Requirement. See sections 8.1 to 8.4 and 8.7 of this Certificate.
Requirement:	C2(b)	Resistance to moisture
Comment:		The systems provide a degree of protection against rain ingress. See sections 4.6 and 10.1 of this Certificate.
Requirement:	C2(c)	Resistance to moisture
Comment:		The systems contribute to minimising the risk of surface and interstitial condensation. See sections 11.1, 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 6.2 and 6.3 of this Certificate.
Regulation:	7	Materials and workmanship
Comment:		The systems are acceptable. See section 13.1 and the *Installation* part 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)
Comment:		The systems can contribute to satisfying these Regulations. See sections 6.2 and 6.3 of this Certificate.

The Building (Scotland) Regulations 2004 (as amended)

Regulation:	8(1)(2)	Durability, workmanship and fitness of materials
Comment:		The systems can contribute to a construction satisfying this Regulation. See sections 12.1 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. See section 7.4 of this Certificate.
Standard:	2.6	Spread to neighbouring buildings
Comment:		The systems is regarded as 'low risk' and therefore can satisfy this Standard, with reference to clauses 2.6.4(1)(2), 2.6.5(2) and 2.6.6(2). See sections 8.1 to 8.7 of this Certificate.
Standard:	2.7	Spread on external walls
Comment:		The systems can satisfy the requirements of this Standard, with reference to clauses 2.7.1(1)(2) and 2.7.2(2). See sections 8.1 to 8.7 of this Certificate.
Standard:	3.10	Precipitation
Comment:		The systems can satisfy this Standard, with reference to clauses 3.10.1(1)(2) and 3.10.6(1)(2). See sections 4.6 and 10.1 of this Certificate.
Standard:	3.15	Condensation
Comment:		The systems can satisfy the requirements of this Standard, with reference to clauses 3.15.1(1), 3.15.4(1) and 3.15.5(1). See sections 11.3 and 11.4 of this Certificate.
Standard:	6.1(b)	Carbon dioxide emissions
Standard:	6.2	Buildings 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(2), 6.1.5(2), 6.1.6(1), 6.2.1(1), 6.2.3(1), 6.2.4(1), 6.2.5(1)(2) and 6.2.10(2). See sections 6.2 to 6.3 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 a 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) [Aspects 1(1)(2) and 2(1)], 7.1.6(1)(2) [Aspects 1(1)(2) and 2(1)] and 7.1.7(1)(2) [Aspect 1(1)(2)]. See section 6.2 of this Certificate.
Regulation:	12	Building standards applicable to conversions
Comment:		All comments given for these systems under Regulation 9, Standards 1 to 6, also apply to this Regulation, with reference to clause 0.12(1)(2) and Schedule 6(1)(2).

(1) Technical Handbook (Domestic).

(2) Technical Handbook (Non-Domestic).

The Building Regulations (Northern Ireland) 2012

Regulation:	23	Fitness of materials and workmanship
Comment:		The systems are acceptable. See section 13.1 and the *Installation* part of this Certificate.
Regulation:	28	Resistance to moisture and weather
Comment:		The systems provide a degree of protection against rain ingress. See sections 4.6 and 10.1 of this Certificate.
Regulation:	29	Condensation
Comment:		The systems contribute to minimising the risk of interstitial and surface condensation. See sections 11.2 and 11.4 of this Certificate.
Regulation:	30	Stability
Comment:		The systems can sustain and transmit wind loads to the substrate. See section 7.4 of this Certificate.
Regulation:	36	External fire spread
Comment:		The systems can satisfy this Regulation. See sections 8.1 to 8.4 and 8.7 of this Certificate.
Regulation:	39	Conservation measures
Regulation:	40	Target carbon dioxide emission rate
Comment:		The systems can enable a construction to satisfy the requirements of these Regulations. See sections 6.2 to 6.3 of this Certificate.

Construction (Design and Management) Regulations 2007

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

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

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

Additional Information

NHBC Standards 2014

NHBC accepts the use of the Structherm Structural EPS/XPS/Phenolic/PIR External Wall Insulation Systems for Solid Wall Structures, provided the chosen system is installed, used and maintained in accordance with this Certificate, in relation to *NHBC Standards*, Part 6 *Superstructure (excluding roofs)*, Chapters 6.9 *Curtain walling and cladding.*

Technical Specification

1 Description

1.1 The Structherm Structural EPS/XPS/Phenolic/PIR External Wall Insulation Systems for Solid Wall Structures comprises standard expanded polystyrene (EPS), enhanced EPS, extruded polystyrene (XPS), phenolic or polyisocyanurate (PIR) insulation in a mechanically-fixed galvanized or stainless steel wire cage, and render and brick-slip finishes.

1.2 The systems (see Figure 1) comprise:

Structherm steel cage panel

- galvanized(1) or stainless steel(2) 'cage', 1200 mm by 2400 mm (standard), with thicknesses of 75 mm (Type 1), 100 mm (Type 2), 125 mm (Type 3) and 150 mm (Type 4). Additional sizes are available on request. See section 2.1 of this Certificate.

(1) Galvanized steel drawn wire to BS 1052 : 1980, zinc plated 20 $g \cdot m^{-2}$ to 30 $g \cdot m^{-2}$ and tensile strength 600 $N \cdot mm^{-2}$ to 800 $N \cdot mm^{-2}$.

(2) Austenitic stainless steel drawn wire, grade 304/1.4301 to BS EN 10088-1 : 2005 and tensile strength 750 $N \cdot mm^{-2}$ to 850 $N \cdot mm^{-2}$.

Insulation

- insulation is cut into strips 50 mm or 100 mm wide and placed within the steel cage panel, with specific thicknesses depending on the panel thickness, as shown in Table 1.

Table 1 Insulation thickness sizes

Panel thickness (mm)	Insulation thickness (mm)
75	55
100	80
125	105
150	130

The types of insulation used are as follows:

- phenolic insulation — with a nominal density of 40 kg·m^{-3}, minimum compressive strength of 150 kN·m^{-2} and tensile strength perpendicular to the faces of 50 kPa. Boards are manufactured to comply with the requirements of BS EN 13166 : 2012
- standard expanded polystyrene (EPS) (white) insulation — with a nominal density of 15 kg·m^{-3}, minimum compressive strength of 70 kN·m^{-2} and minimum tensile strength of ≥ 100 kN·m^{-2}. The boards are manufactured to comply with the requirements for EPS 70, Class E material to BS EN 13163 : 2012
- enhanced expanded polystyrene (EPS) (grey) insulation — with a nominal density of 15 kg·m^{-3}, minimum compressive strength of 70 kN·m^{-2} and a nominal tensile strength perpendicular to the face of 150 kPa. The boards are manufactured to comply with the requirements for EPS 70, Class E material to BS EN 13163 : 2012
- extruded polystyrene (XPS) insulation boards — with a nominal density of 27 kg·m^{-3} and a minimum compressive strength of 200 kN·m^{-2}. The boards are manufactured to comply with the requirements of BS EN 13164 : 2012
- polyisocyanurate (PIR) insulation — with a nominal density of 32 kg·m^{-3}, a minimum compressive strength of 150 kN·m^{-2} and a nominal tensile strength perpendicular to the face of 80 kPa. The boards are manufactured to comply with the requirements of BS EN 13165 : 2012.

Mechanical fixings and panel-retaining brackets

- SL Concrete Screws[1] — galvanized carbon steel or stainless steel with 6 mm to 14 mm nominal diameter, to be used with bespoke 80 mm by 40 mm galvanized or stainless steel washers or bespoke steel brackets.

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

- BR01 panel-retaining brackets — 2 mm thick galvanized carbon steel or stainless steel bespoke c-channel bracket, 110 mm (height) by 135 mm (width) by 105 mm (length).

Basecoat

- Structherm Fibre Basecoat — a cement-based, polymer-modified basecoat with added fibres. Supplied in powder form.

Primers

- Structherm Acrylic Primer — a water-based single-component primer, supplied in liquid form, for use with Structherm Acrylic Texture finish
- Structherm Silicone Primer — a water-based single-component primer, supplied in liquid form, for use with Structherm Silicone Texture finish
- Structherm Acrylic Brick-Slip Primer — a water-based single-component primer, supplied in liquid form, for use with Structherm Acrylic Brick-Slips.

Brick-slip adhesive

- Structherm Acrylic Brick-Slip Adhesive — a pre-mixed organic-bound, water-based cement-free adhesive.

Finishes

- Structherm Dash Receiver — a polymer-modified cement binder system containing fillers, and supplied in powder form
- Structherm Brick-Effect Render — a polymer-modified cement binder two-layer system containing fillers, produced in powder form
- Structherm Acrylic Brick-Slips — poly-acrylic slips containing quartz sands fillers. Standard sizes of 50 mm by 210 mm by 4 mm, 65 mm by 215 mm by 4 mm and 71 mm by 240 mm by 4 mm with a nominal weight of 6·kg·m^{-2}. Available as straight and corner brick-slips in a range of colours
- Structherm Acrylic Texture — a polymer-modified, acrylic coating system, produced in paste form in a range of colours, and containing grain (sizes: 1.0 mm, 1.2 mm, 1.5 mm, 2.0 mm)
- Structherm Silicone Texture — a polymer-modified, silicone coating system, produced in paste form in a range of colours, and containing grain (sizes: 1.0 mm, 1.2 mm, 1.5 mm, 2.0 mm)
- Riv-oland Venezia — an acrylic polymer paste containing pigments and marble grit (sizes: 1.0 mm, 1.2 mm, 1.5 mm, 2.0 mm)
- Riv-oland Granigliato — an acrylic polymer paste containing marble chips (sizes: 1.0 mm, 1.2 mm, 1.5 mm, 2.0 mm).

Aggregates

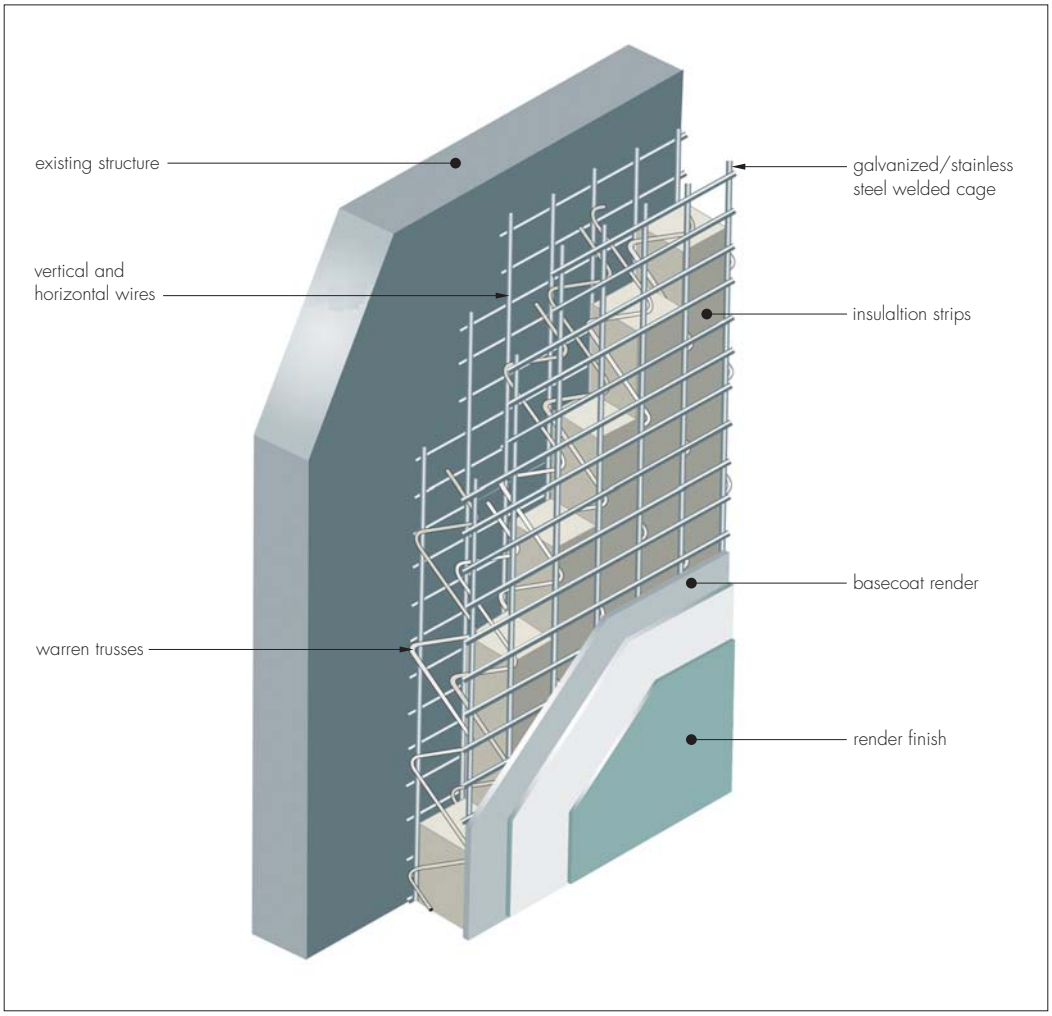
- Structherm Spar-Dash Aggregates, available in a range of sizes and colours.

1.3 Ancillary items supplied with the systems but outside the scope of this Certificate:

- base trims and connection channels — galvanized or stainless steel
- under and oversills, screw washers and mesh clips — galvanized steel to BS EN 10142 : 2000
- joint and corner reinforcing mesh — galvanized or stainless steel
- foam rubber filler strip
- profiles — a range of standard profiles for wall base, end stop, corner mesh and expansion joints. Profiles are available in organic polyester powder-coated galvanized steel or stainless steel and PVC

- profile fixings — hammer drive, fir tree or adhesive
- sealant — silicone sealant
- Vertex/Hartco clips.

Figure 1 Structherm Structural EPS/XPS/Phenolic/PIR External Wall Insulation System



1.4 The steel cage panel is fixed to the substrate using mechanical fixings with bespoke washers or BR01 retaining brackets. The insulation boards are protected by basecoat, and selected finishes applied to the required thickness.

2 Manufacture

2.1 The steel cage panel is composed of steel drawn wire, formed into warren trusses (75 mm, 100 mm, 125 mm or 150 mm deep, to reflect the various panel thicknesses). Warren trusses comprise 2.96 mm diameter line wires, with 2.21(1) mm or 2.96(2) mm diameter bent diagonal wires spot-welded at 100(1) mm or 200(2) mm centres. Panel cross wires (2.03 mm diameter) are spot-welded to each panel face at 50 mm centres.

(1) For 75 mm (Type 1), 100 mm (Type 2) and 125 mm (Type 3) thickness panels.

(2) For 150 mm (Type 4) thickness panel.

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

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

- agreed with the manufacturer the quality control procedures and system 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.

2.4 The management system of Structherm Ltd has been assessed and registered as meeting the requirements of BS EN ISO 9001 : 2008 (Certificate CP 000183) and BS EN ISO 14001 : 2004 (Certificate CPE 00027) by CPC — Construction Products Certification.

3 Delivery and site handling

3.1 The Structherm panels are delivered to site wrapped in polythene. Each panel carries the system's identification and batch numbers.

3.2 Components are delivered in the packages and quantities listed in Table 2. Each package carries the manufacturer's system identification and batch number.

Table 2 Component supply details

Component	Quantity and packaging
Basecoat/powder finish coats	25 kg bags
Structherm acrylic/silicone primers	14 litre tubs/25 kg tubs
Acrylic brick-slip primer	15 kg tub
Acrylic/silicone paste finish coats	25 kg tubs
Acrylic brick-slip adhesive	20 kg tub
Acrylic brick-slips:	
straight	10 kg box
corner	3.5 kg box
Mechanical fixings	boxed by manufacturer

3.3 The panels should be stored dry and under cover, on a firm, clean, level base, off the ground and protected from rust and prolonged exposure to sunlight and weather/frost until required for use. Care should be taken when handling the panels to avoid damage.

3.4 The insulation should be protected from solvents and bitumen and must not be exposed to open flame or other ignition sources.

3.5 The paste, liquid and powder products must be stored under cover in dry conditions off the ground and between 5°C and 30°C, and protected from frost at all times. Contaminated material must be discarded.

3.6 The acrylic brick-slip adhesive must be stored in frost-free conditions in temperatures not above 30°C and protected from exposure to sunlight. Tubs of unopened adhesive will have a shelf-life of up to 18 months when stored correctly.

Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on the Structherm Structural EPS/XPS/Phenolic/PIR External Wall Insulation Systems for Solid Wall Structures.

Design Considerations

4 General

4.1 When installed in accordance with this Certificate, the Structherm Structural EPS/XPS/Phenolic/PIR External Wall Insulation Systems for Solid Wall Structures are effective in reducing the thermal transmittance (U value) of the 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. Only details specified by the Certificate holder should be used.

4.2 The chosen system will improve the structural stability and weather resistance of a wall, and provide a decorative finish. However, it may be installed only where the substrate is inherently waterproof and where there are no signs of dampness on the inner surface of the wall, other than those caused solely by condensation.

4.3 The chosen system is applied to the outside of exterior walls of masonry and dense or no-fines concrete construction and is suitable for use on new or existing domestic or non-domestic buildings. Prior to installation of the systems, wall surfaces should comply with section 14 of this Certificate.

4.4 The systems are for use in buildings up to 18 metres in height, except for those using EPS and PIR insulation with a silicone-textured finish, which are suitable for use without height restriction when constructed as described in section 8.7.

4.5 The steel cage panels can be designed to be fully supported or span between the existing columns of the substrate.

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

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

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

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

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

4.10 External plumbing should be removed before installation and alterations made to underground drainage, where appropriate, to accommodate repositioning of the plumbing on the finished face of the systems.

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

5 Practicability of installation

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

Note: The BBA operates a UKAS-accredited Approved Installer Scheme for external wall insulation; details of approved installer companies are included on the BBA 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 : 2007, BS EN ISO 10211 : 2007 and BRE Report BR 443 : 2006, using the thermal conductivity (λ_D value) of the insulation materials given in Table 3.

Table 3 Insulation thermal conductivity

Insulation	Thickness (mm)	λ_D value ($W \cdot m^{-1} \cdot K^{-1}$)
Standard EPS (white)	50 to 200	0.038
Enhanced EPS (grey)	50 to 200	0.032
Extruded polystyrene	50 to 200	0.033
Phenolic	25 to 44	0.021
	45 to 120	0.020
PIR	≤ 79	0.026
	80 to 119	0.025
	120 to 200	0.024

6.2 The U value of a wall construction will depend on the selected insulation, the insulation thickness and the insulating value of the substrate and its internal finish. Example U values for existing constructions, before and after installing the panels, are given in Table 4.

Table 4 Example U values(1) achieved after installing the Structherm Structural External Wall Systems

Existing construction	Existing U value ($W \cdot m^{-2} \cdot K^{-1}$)	Steel cage panel type	Insulation thickness (mm)	Finish U value ($W \cdot m^{-2} \cdot K^{-1}$)
Brick-clad no-fines	1.12	125 mm stainless steel cage with enhanced EPS (reference SPL125)	105	0.28
Brick-clad no-fines	1.12	125 mm stainless steel cage with PIR (reference SPIR125)	105	0.24
Concrete cavity	0.85	125 mm galvanized steel cage with enhanced EPS (reference GPL125)	105	0.30
Concrete cavity	0.85	125 mm stainless steel cage with PIR (reference SPIR125)	105	0.23

(1) U values based on:
- 200 truss wires per m^2
- 2 mm diameter wires
- 25 mm air gap between insulation and substrate
- 24 mm external render.

6.3 The systems can contribute to maintaining continuity of thermal insulation at junctions between elements and openings. For Accredited Construction Details, the corresponding ψ-values (psi) in BRE Information Paper IP 1/06, Table 3, may be used in carbon emission calculations in Scotland and Northern Ireland. Detailed guidance for other junctions and on limiting heat loss by air infiltration can be found in:

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

Scotland — Accredited Construction Details (Scotland)

Northern Ireland — Accredited Construction Details (version 1.0).

7 Strength and stability

General

7.1 When installed on suitable walls, the systems can adequately transfer to the wall the self-weight and resist negative (suction) and positive (pressure) wind loads normally experienced in the United Kingdom.

7.2 Positive wind load is transferred to the substrate supports directly via bending and compression of the render and the steel cage to the substrate.

7.3 Negative wind pressure is resisted by the bond between each component. The steel cages are retained by the appropriate mechanical-fixing anchors (see section 1.2).

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

7.5 Assessment of structural performance for individual buildings should be carried out by a suitably qualified engineer or other appropriately qualified person to confirm that:

- the substrate wall has adequate strength to resist the additional loads that may be applied as a result of installing the system, ignoring any positive contribution that may occur from the system
- the proposed system and associated fixing layout provide adequate resistance to negative wind loads based on the results of the site investigation and test results
- an appropriate number of site-specific pull-out tests are conducted on the substrate of the building to determine the minimum resistance to failure of the fixings. The characteristic pull-out resistance should be determined in accordance with the guidance given in ETAG 014 : 2011, Annex D.

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

7.7 Tests performed on the systems indicate that the structural panels have a basic racking resistance of 0.51 $kN \cdot m^{-1}$ and racking load strength greater than that of 9.5 mm plywood.

7.8 The design wind resistances derived from tests are given in Table 5.

Table 5 Design wind resistances[1] by support centres and fixing type[2]

Panel designation (mm)	Pressure	Design wind-load ($k \cdot Nm^{-2}$) by support centres (mm)					
		Washer plate			BR01 bracket		
		600	1200	2000	2000	3000	3600
75 mm	positive	4.00	3.80	1.40	2.00	1.60	1.60
	negative	4.00	3.80	1.40	2.00	1.60	1.60
100 mm	positive	4.00	3.90	2.10	2.65	2.15	1.90
	negative	4.00	3.90	2.10	2.65	2.15	1.90
125 mm	positive	4.00	3.90	2.10	2.65	2.15	1.90
	negative	4.00	3.90	2.10	2.65	2.15	1.90
150 mm	positive	4.00	3.90	2.10	2.65	2.15	1.90
	negative	4.00	3.90	2.10	2.65	2.15	1.90

(1) The main criteria in the derivation of the loads were:

- reinforcement consists of a total of 24 mm to 26 mm thick render applied to the panel
- this table is based on experimental data and an empirical analysis of such data
- the spans ensure deflection is limited to span/200 for positive and negative pressure
- the panel is subjected to wind loads and self-weight only
- for spans greater than 2000 mm, a bespoke BR01 bracket must be used
- for non-specific spans, the Certificate holder can advise on safe working loads.

(2) Assuming correct type and number of fixings used.

Impact loading

7.9 Hard body impact tests were carried out and the systems are suitable for use in all Use Categories[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 systems 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 external surface of the systems in accordance with BS EN 13501-1 : 2007 or as defined in the national Building Regulations is shown in Table 6.

Table 6 System's fire classifications

Rendering system	Classification
Structherm Dash Receiver + Dash Aggregate Riv-oland Venezia Riv-oland Granigliato	Class 0 or 'low risk'
Structherm Acrylic Texture Structherm Silicone Texture Structherm Acrylic Brick-Slips Structherm Brick-Effect Render Finish	B-s1, d0

8.2 The fire classifications apply to the full range of thicknesses covered by this Certificate.

8.3 For houses in Scotland, and for all buildings in England and Wales and Northern Ireland, the systems are suitable for use on, or at any distance from, the boundary.

8.4 The systems are restricted for use in buildings up to 18 metres in height except for the systems detailed in clause 8.7 of this Certificate.

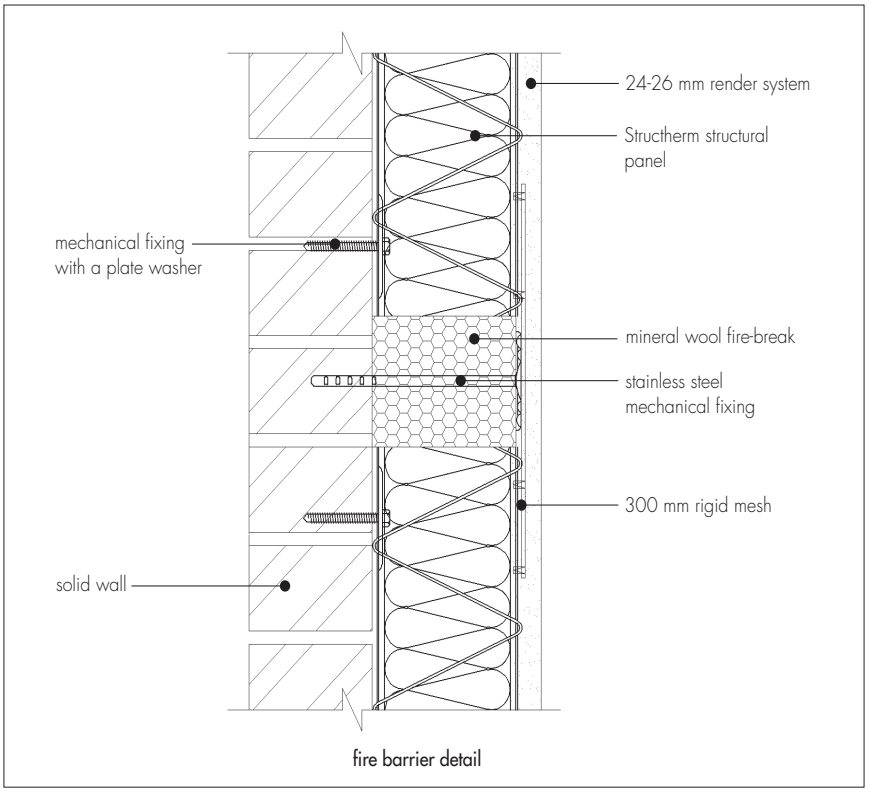
8.5 For flats and maisonettes and non-domestic buildings in Scotland, the systems are suitable only for use more than one metre from the boundary, except for the systems detailed in clause 8.7 of this Certificate.

8.6 The systems are not classified as 'non-combustible', therefore calculations for unprotected areas may apply, dependent on the fire resistance characteristics of the wall, except for the systems detailed in clause 8.7 of this Certificate.

8.7 For buildings installed with systems using up to 125 mm galvanized/stainless steel cage panels with standard/enhanced EPS or PIR insulation of thickness up to 105 mm, with silicone texture render finish and incorporating mineral wool fire barriers mechanically fixed by stainless steel fixings, there is no restriction on the height nor boundary. The systems described have been tested and met the performance criteria set in BRE Report BR 135 : 2003, Annex A. For other systems, reference should be made to sections 8.3 to 8.6 and 8.8 of this Certificate.

8.8 For application to second storey walls and above, it is recommended that the designer considers fire barriers with stainless steel fixings in line with compartment walls and floors as advised in BRE Report BR 135 : 2013 (see Figure 2).

Figure 2 Fire barriers



fire barrier detail

9 Proximity of flues and appliances

When the insulation systems are installed in close proximity to certain flue pipes, the relevant provisions of the national Building Regulations should be met:

England and Wales — Approved Document J

Scotland — Mandatory Standard 3.19, clause 3.19.4[1][2]

(1) Technical Handbook (Domestic).

(2) Technical Handbook (Non-Domestic).

Northern Ireland — Technical Booklet L.

10 Water resistance

10.1 The systems will provide a degree of protection against rain ingress. However, care should be taken to ensure that walls are adequately weathertight prior its application. The insulation systems may 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 weathertightness of wall constructions. The designer should select a construction appropriate to the local wind-driven index, paying due regard to the design detailing, workmanship and materials to be used.

10.4 At the tops of walls, the systems should be protected by an adequate overhang or other detail designed for use with these types of systems (see Figure 8).

11 Risk of condensation

11.1 Designers must ensure that an appropriate condensation risk analysis has been carried out for all parts of construction, including openings and penetrations at junctions between the insulation system, to minimise the risk of condensation. The recommendations given in 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 8, Annex D) 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 this Certificate.

11.5 The equivalent air layer thickness (S_d) and water vapour resistance factor (μ) for the insulations and finishes are as given in Table 7.

Table 7 Equivalent air layer thickness (S_d) and water vapour resistance factor (μ)

Description	S_d (m)	μ
Expanded polystyrene (white/grey)	—	60[1]
Extruded polystyrene (XPS)	—	150[2]
Phenolic	—	50[1]
PIR	—	60[2]
Structherm Dash Receiver + Dash Aggregate	—	0.14[4]
Riv-oland Venezia	—	10[1]
Riv-oland Granigliato	—	10[1]
Structherm Acrylic Texture	0.86[3]	—
Structherm Silicone Texture	0.20[3]	—
Structherm Acrylic Brick-Slips	0.19[3]	—
Structherm Brick-Effect Render Finish	0.20[3]	—

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

(2) Taken from BS EN 12524 : 2000, Table 2.

(3) Obtained from test on basecoat, primer and render finish together.

(4) Obtained from test on Structherm Dash Receiver only.

12 Maintenance and repair

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

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

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

13 Durability

13.1 The 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 Any render containing Portland 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.

13.3 The finishes may break up the flow of water on the surface and reduce the risk of discoloration by water runs. The finish may become discoloured with time, the rate depending on locality, initial colour, the degree of exposure and atmospheric pollution, as well as the design and detailing of the wall. In common with traditional renders, discoloration by algae and lichens may occur in wet areas. The appearance may be restored by a suitable power wash or, if required, by over coating.

13.4 To maintain a high quality aesthetic appearance, it may be necessary to periodically overcoat the building using systems compatible coatings recommended by the Certificate holder and in accordance with BS EN 1062-1 : 2004. 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 Structherm Structural EPS/XPS/Phenolic/PIR External Wall Insulation System. A specification must be prepared for each elevation of the building indicating, for example:

- position of starter tracks and render beads
- additional rigid corner mesh at corners of openings
- detailing around windows, doors and at eaves
- damp-proof course (dpc) level
- location and type of weather seals to be used and location of water-deflection channels
- areas where flexible sealants must be used
- position of fire barriers.

14.2 The survey should include tests conducted on the substrate of the building by the Certificate holder or their approved installers (see section 15) to determine the pull-out resistance of the proposed mechanical fixings. An assessment and recommendation is made on the type and number of fixings required to withstand the building's expected wind loading based on calculations using the relevant wind speed data for the site and the pull-out resistances (see section 7).

14.3 Surfaces should be sound, clean, and free from loose material. The flatness of surfaces must be checked; this may be achieved by using a straight-edge spanning the storey height. Excessive irregularities can be adjusted by using the BR01 brackets or packers behind the fixing positions.

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

14.5 On existing buildings, purpose-made sills must be fitted to extend beyond the finished face of the system. New buildings should have suitably deep sills designed to prevent water ingress, which should incorporate drips to shed water clear of the system.

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

15 Approved Installers

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

- employing operatives who have been trained and approved by the Certificate holder to install the system
- which has undertaken to comply with the Certificate holder's application procedure, containing the requirements 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 of the system must be carried out in accordance with the Certificate holder's current installation instructions.

16.2 Weather conditions should be monitored to ensure correct curing conditions. Application of coating materials must not be carried out at temperatures below 5°C (and should remain above freezing for 24 to 48 hours after application) or above 30°C, or if exposure to frost is likely. The coating must be protected from rapid drying.

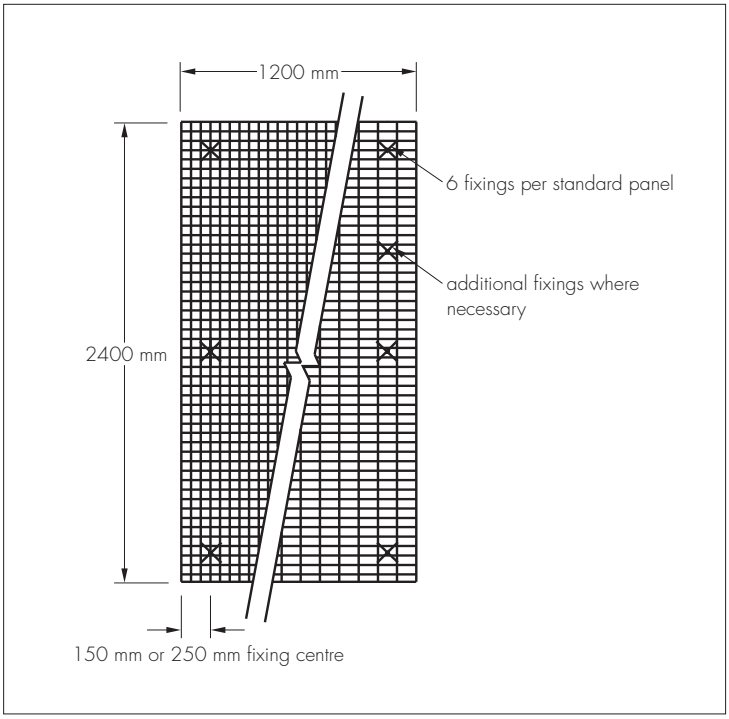
16.3 All rendering should be in accordance with the relevant recommendations of BS EN 13914-1 : 2005.

Positioning and securing steel cages

16.4 The galvanized or stainless steel base trim is fixed above the dpc using profile fixings at 300 mm centres. Base rail connectors are inserted at all rail joints.

16.5 Each standard size panel is fixed to the substrate with at least six mechanical anchors with bespoke washers (see Figure 3) or four bespoke BR01 brackets, two on top and two at the bottom. Part-panels are fixed with at least three anchors with washers.

Figure 3 Typical fixing pattern

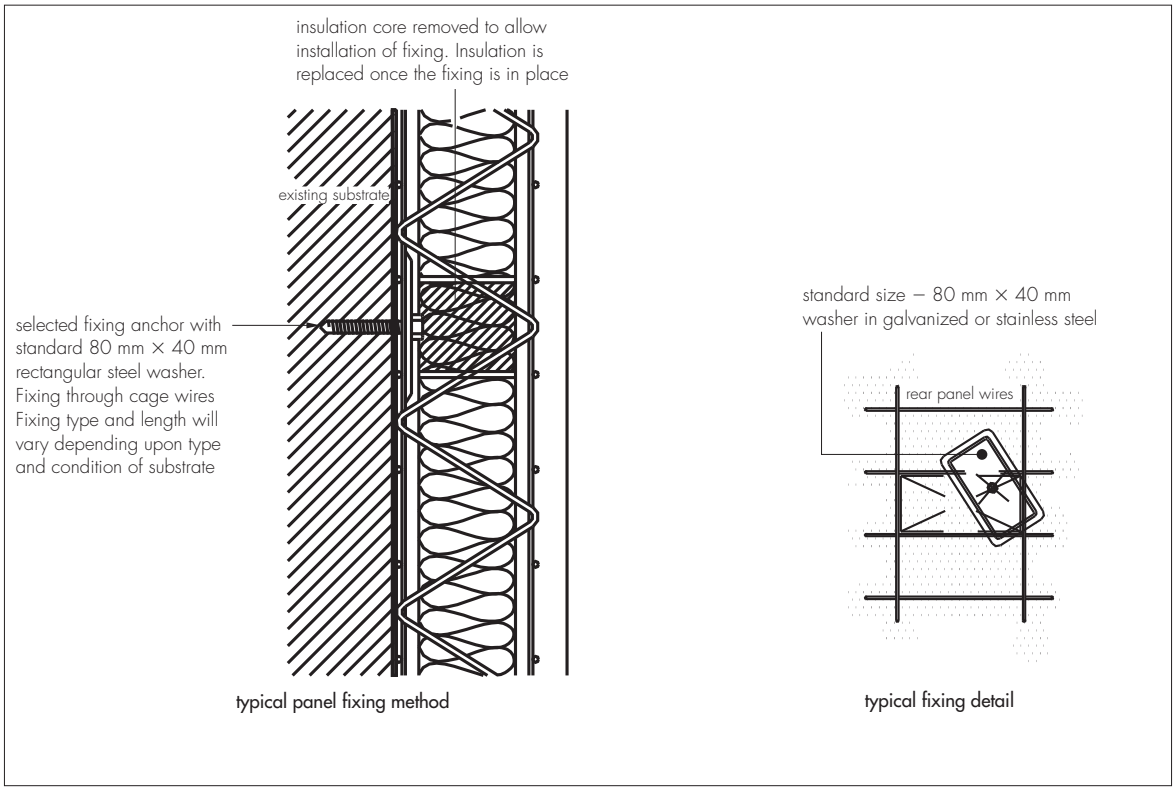


16.6 Sections of the insulant core of the panel are removed by carefully cutting out with a fine-toothed saw at the fixing points.

16.7 For each fixing point, the required hole depth is drilled into the substrate according to the fixing manufacturer's recommendations. The panel is secured with a bespoke steel washer (ensuring two of the panel wires are trapped against the substrate) then the insulant core replaced (see Figure 4).

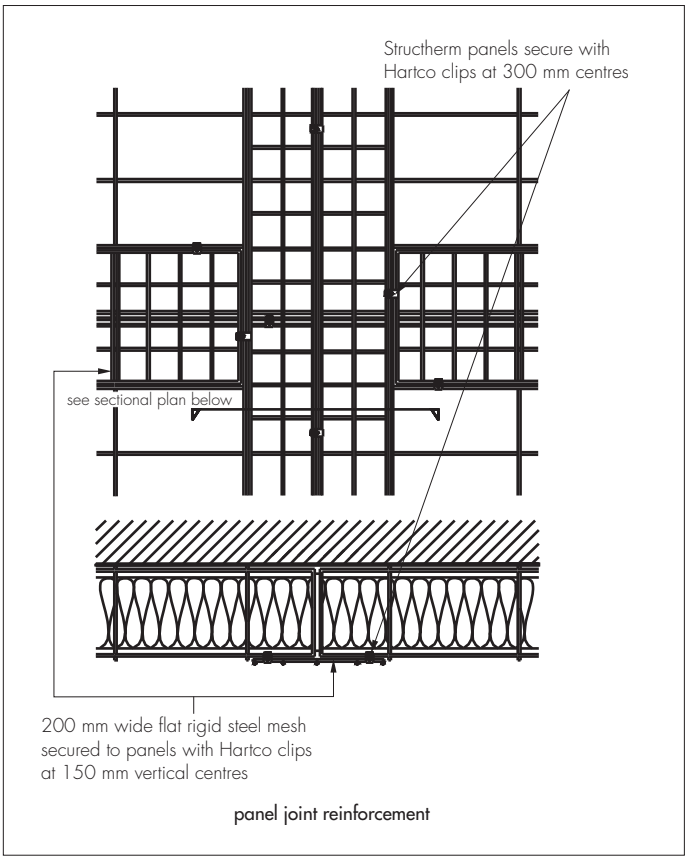
16.8 Lengths of compressible filler strip are positioned in the vertical and horizontal joints between subsequent panels, and fixing to the substrate continues as previously described.

Figure 4 Typical fixing detail



16.9 Panel-to-panel fixing is completed with jointing meshes (with a minimum 100 mm overlap either side of the panel joint), which are clipped to the panel face using pneumatically-applied Vertex/Hartco clips at 150 mm staggered centres (see Figure 5).

Figure 5 Panel joint reinforcement



16.10 Where necessary, standard panels can be cut to size (to fit around details such as doors and windows) with an abrasive disc saw. The wire and insulant core of the panel are cut through from one side, the panel turned over,

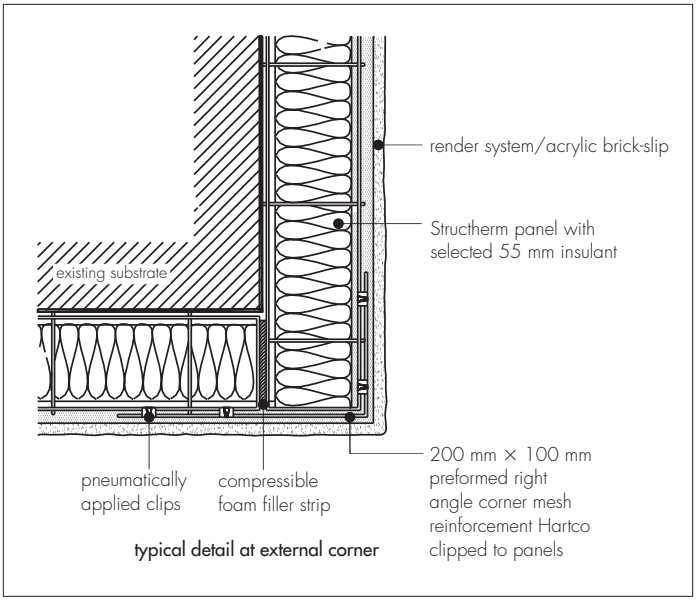
and the cut completed from the other side. The cut edges are reinforced at the joints with 200 mm wide flat mesh, clipped at 150 mm centres to each panel.

16.11 Installation continues until the whole wall is completely covered.

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

16.13 Pre-manufactured corner meshes are used at external/internal corners and to window/door reveals to provide additional reinforcement and render support. Mesh sizes are bespoke to project detail and relevant to panel type/thickness, ensuring a minimum 100 mm overlap to the corner of the panel (see Figure 6).

Figure 6 Corner detail

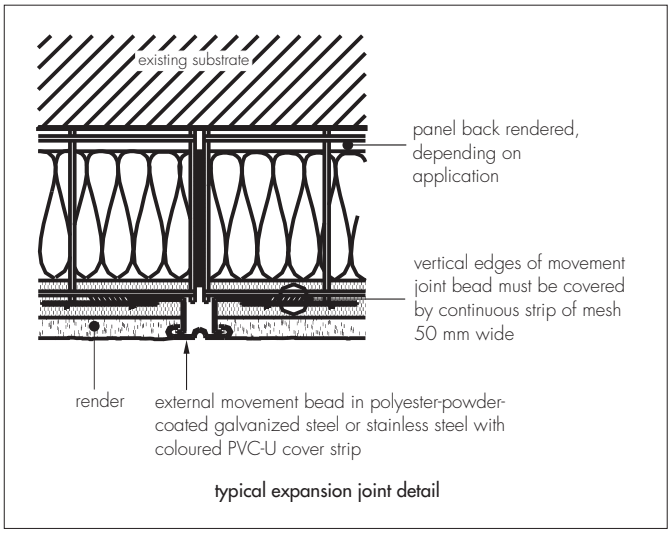


16.14 Where fixtures are located on the structure (eg wall vents, balanced flues, electric boxes), the panel should be cut to fit neatly around the obstruction. In some cases, fillets of insulant, encased in wire mesh, are fixed to allow splayed-rendering around the fixture. Heavy cables on external walls are left in position and covered with a metal 'top hat' section. The panels are then fitted over the top.

Movement joints

16.15 Movement joints in the substrate should be continued through the system using purpose-made PVC, powder-coated galvanized steel or stainless steel trims (see Figure 7). In addition, surface-mounted movement joints can be installed, with the cage wire cut behind prior to application. The basecoat should have a crack induced at the movement joint location.

Figure 7 Typical movement joint



16.16 Expansion beads are fixed vertically in agreed positions, depending on the individual requirements of each job (but at approximately seven metre centres along a building)

Basecoat

16.17 The basecoat is prepared by mixing the contents of each 25 kg bag with approximately 4 to 5 litres of cold, clean water, using a concrete or paddle mixer or pump machine. Mixing times should be at least five minutes to allow an even dispersion of the resins.

16.18 The basecoat is applied onto the surface of the panel, built up in layers to a total thickness of 16 mm to 24 mm — the amount required depending on the finish chosen — ensuring 2 mm to 3 mm coverage over panel wires. Care must be taken to achieve complete coverage of the cage and to butt the basecoat under details such as window sills. The surface of the basecoat is trowelled smooth and then scored with a toothed-trowel or comb to provide a good key for the next coat.

16.19 The drying period will depend on weather conditions but each basecoat layer must be left to harden for at least two days (48 hours) before application of the next coat. After the basecoat has hardened, any contaminants such as grease and chalking should be removed,

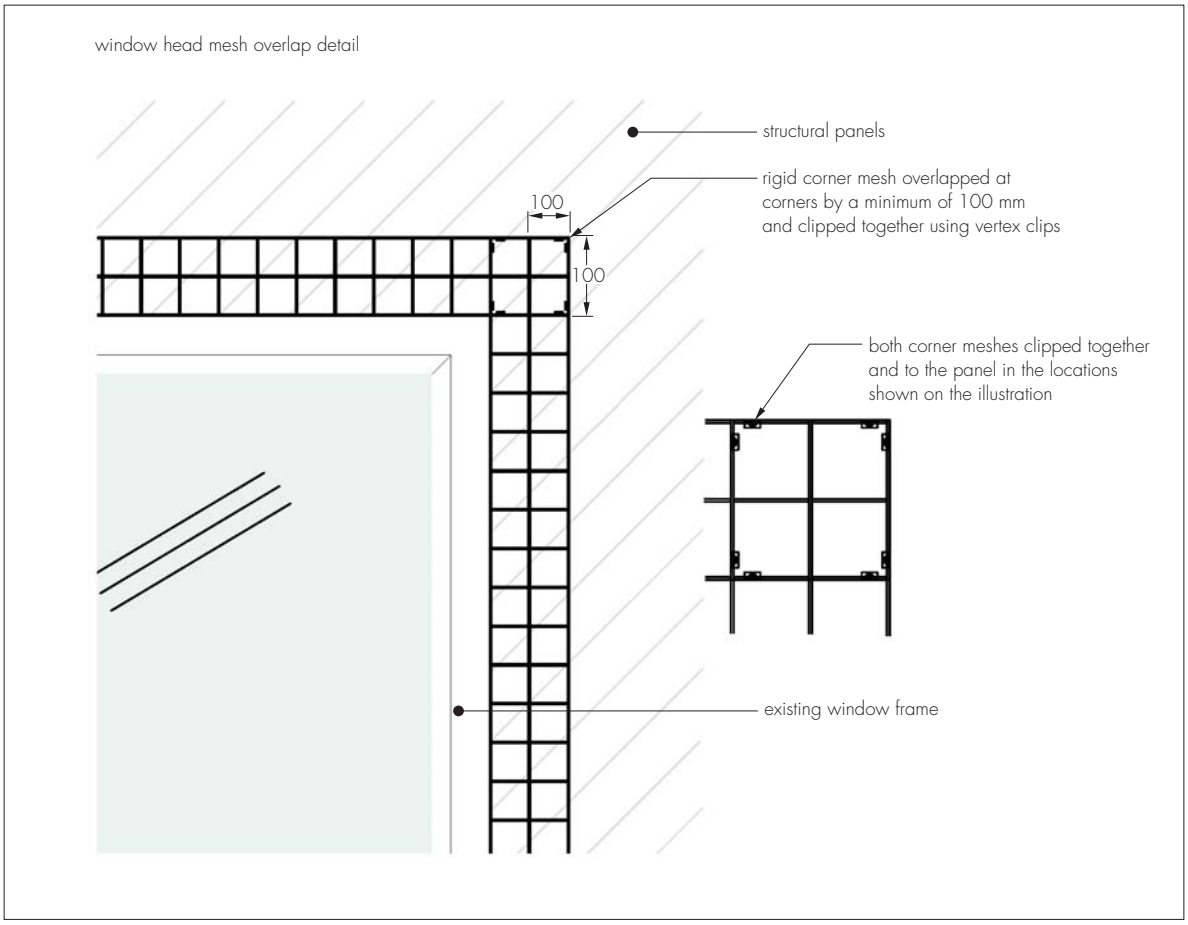
16.20 Prior to the render top coat, a bead of clear silicone sealant is gun-applied at window and door frames, overhanging eaves, gas and electric meter boxes, wall vents or where the render abuts any other building material or surface.

16.21 Corner beads, if required, are fixed to all building corners and to door and window heads and jambs.

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

16.23 Rigid corner mesh is applied to all corners to openings and is cut so that the corners overlap one another by a minimum of 100 mm. The laps are then clipped together, and clipped to the panel behind to provide a continuous reinforced corner junction, as shown in Figure 8.

Figure 8 Corner reinforcement



Finishes

16.24 The total thickness of the basecoat and finish must be between 24 mm and 26 mm. Table 8 shows the thicknesses for the various finishes.

Table 8 Thicknesses of finishes

Finish coat	Thickness range
Structherm Dash Receiver	6 to 8 mm
Structherm Spar-Dash Aggregates	6 to 8 mm chips
Riv-oland Venezia	1.0, 1.2, 1.5, 2.0 mm
Riv-oland Granigliato	1.0, 1.2, 1.5, 2.0 mm
Structherm Acrylic Texture	1.0, 1.2, 1.5, 2.0 mm
Structherm Silicone Texture	1.0, 1.2, 1.5, 2.0 mm
Structherm Acrylic Brick-Slips	4 mm
Structherm Acrylic Brick-Slip Adhesive	4 to 5 mm
Structherm Brick-Effect Render	
mortar coat	6 to 8 mm
facing coat	3 to 6 mm (depending on brick joint depth required)

Structherm Spar-Dash Receiver and Aggregates

16.25 For a spar-dash finish, Structherm Dash Receiver is trowel-applied to a thickness of 6 mm to 8 mm. While the dash receiver is still soft, Structherm Spar-Dash Aggregates are thrown or sprayed onto the surface — on completion, the surface must be checked to ensure an even coverage. Where necessary, the aggregate should be lightly tamped to ensure that a good bond is achieved.

Riv-oland Venezia and Granigliato

16.26 Before application over the dried basecoat, Riv-oland Venezia and Granigliato should be gently mixed. Venezia is applied evenly to the surface using a stainless steel float trowel, and smooth float finished with a plastic trowel before a surface film is formed. Granigliato may be applied in the same manner but using a stainless steel trowel throughout. The finishes are applied to the thicknesses specified in Table 8.

Silicone Texture and Acrylic Texture finishes

16.27 Silicone or acrylic primer is applied by roller or brush at 0.2 $kg \cdot m^{-2}$ to 0.3 $kg \cdot m^{-2}$. The primer must be allowed to dry before application of the finish coat.

16.28 Structherm Acrylic Texture and Structherm Silicone Texture finishes are supplied ready-to-use although a maximum of 2% potable water can be mixed into the 25 kg tub prior to application.

16.29 The finishes are applied to the thicknesses specified in Table 8, using a stainless steel trowel and finished with a plastic trowel to create a textured finish.

16.30 To prevent the finish from drying too rapidly, it should not be applied in direct sunlight and continuous surfaces should be completed without a break.

Brick-Effect Render finish

16.31 Structherm Brick-Effect Render should be mixed with 4 to 5 litres of potable water per 25 kg bag for a minimum of 5 minutes using an electric paddle mixer to disperse the additives.

16.32 The first (mortar) layer should be applied to the surface of the basecoat using a hawk and trowel or projection render machine to a minimum thickness of 6 mm and ruled off to a flat finish.

16.33 After the mortar layer has started to stiffen, the second layer (brick-face) is applied to an average thickness of 3 mm to 6 mm depending on the brick joint depth required, using a hawk and trowel, or projection render machine.

16.34 The brick face layer should be cut out to the required pattern after it has been shaded and textured. The brick face layer is cut through completely and the mortar layer is cut into slightly using an appropriate bespoke cutting tool. This reproduces recessed mortar coursing of the brickwork as required.

16.35 Following further stiffening of the materials, any face materials left by the cutting out should be lightly brushed and removed using a soft bristled brush.

16.36 The finish must be allowed to thoroughly dry out (48 hours to 1 week, depending on weather conditions).

Acrylic Bricks-Slips

16.37 Structherm Acrylic Brick-Slip Primer is applied by roller or brush. The primer must be dry before application of the acrylic brick-slip adhesive.

16.38 Structherm Acrylic Brick-Slip Adhesive is applied by a 5 mm notch trowel to the entire surface of the primer.

16.39 As brick-slips can be subject to shade variation, they should be selected at random from different boxes.

16.40 Structherm Acrylic Brick-Slips are applied by hand in brick bond fashion, lined and levelled into the adhesive. The brick-slips should be fully encapsulated in adhesive. During application, work should progress from top to bottom lines.

16.41 Joints are normally 10 mm (minimum) wide and when pointing a suitably sized brush is used to smooth out the acrylic adhesive into the joints between the brick-slips and left to dry.

All finishes

16.42 At the tops of walls, the system should be protected by an adequate overhang or by an adequately sealed, purpose-made flashing. Care should be taken in the detailing of the system around such features as openings, projections and at eaves to ensure adequate protection against water ingress and to limit the risk of water penetrating the system (see Figures 9 and 10).

Figure 9 Typical window sill

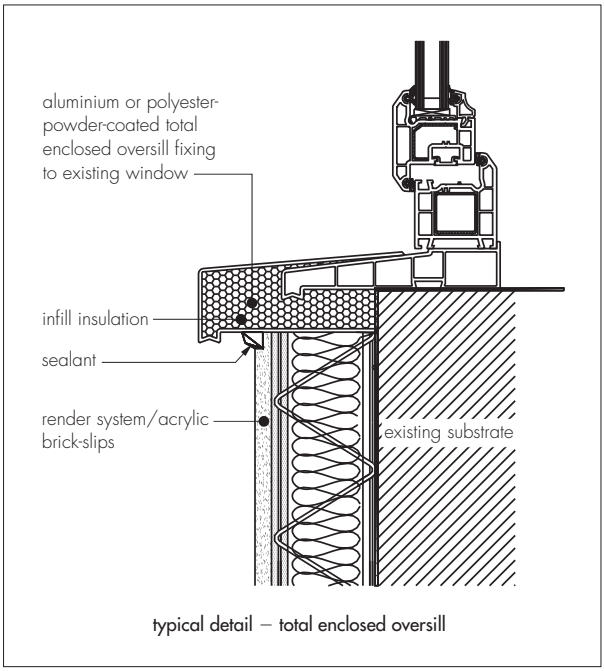
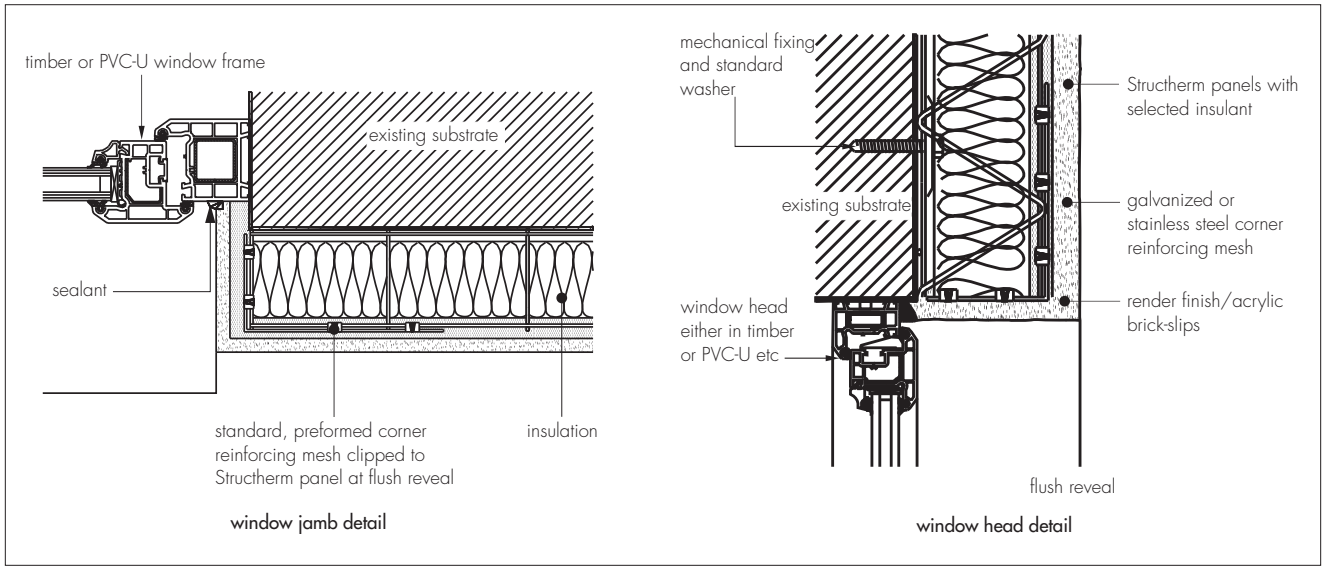


Figure 10 Typical window reveal and head details



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

Technical Investigations

17 Tests

Tests were carried out to determine:

- heat/spray cycling
- resistance to freeze/thaw
- impact resistance.
- water vapour permeability

- fire performance
- durability of finish coatings
- bond strength between basecoat and insulation
- pull-out resistance.

18 Investigations

18.1 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.

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

18.3 The adequacy of fixings and durability of finish was checked.

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

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ETAG 014 : 2011 *Guideline for European Technical Approval of Plastic Anchors for fixing of External Thermal Insulation Composite Systems with Rendering*

19 Conditions

19.1 This Certificate:

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

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

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

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

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

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

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

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

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