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Agrément Certificate
14/5100
Product Sheet 1

SIP ENERGY STRUCTURAL INSULATED PANEL SYSTEM

SIP ENERGY LOADBEARING WALL AND ROOF PANELS

This Agrément Certificate Product Sheet(1) relates to relates to the SIP Energy Loadbearing Wall and Roof Panels, structurally insulated panels for use above the damp-proof course in domestic and non-domestic applications up to three storeys high (maximum storey height of 3 metres) as the loadbearing inner leaf of an external cavity wall or as part of separating walls, internal loadbearing walls and pitched roofs. The panels can also be used as infill wall panels in multi-storey framed buildings subject to design and fire limitations.

(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

Strength and stability — the wall and roof panels will have adequate strength and stiffness when used in accordance with the provisions of this Certificate (see section 6).

Thermal performance — walls and roofs constructed from the panels can achieve U values specified in the national Building Regulations (see section 7).

Air permeability — dwellings incorporating the panels can achieve adequate air barrier continuity provided there is effective sealing around junctions, openings and penetrations (see section 8).

Behaviour in relation to fire — with adequate protection, panels used in external walls and separating walls will meet the required fire resistance periods given in the relevant national Building Regulations (see section 10).

Resistance to airborne sound — test data indicates that separating walls constructed from the panels can provide satisfactory resistance to airborne sound transmission when used in conjunction with suitable flanking elements (see section 12).

Durability — provided the installation remains weathertight, a life of at least 60 years may be expected (see section 15).

The BBA has awarded this Certificate to the company named above for the products described herein. These products 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: 26 February 2014

Brian Chamberlain
Head of Approvals — Engineering

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, SIP Energy Loadbearing Wall and Roof Panels, if installed, used and maintained in accordance with this Certificate, will meet or contribute to meeting 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
Requirement:	A3	Disproportionate collapse
Comment:		Walls and roofs constructed from the panels will have sufficient strength and stiffness when designed in accordance with sections 6.1 to 6.4 of this Certificate.
Requirement:	B3(1)(2)(3)	Internal fire spread (structure)
Comment:		The panels with an appropriate lining can be used in walls required to have a fire resistance in excess of 60 minutes. See sections 10.1, 10.6 and 10.9 of this Certificate.
Requirement:	C2(c)	Resistance to moisture
Comment:		The panels can adequately limit the risk of surface condensation and will contribute to minimising the risk of interstitial condensation. See sections 9.1 and 9.2 of this Certificate.
Requirement:	E1	Protection against sound from other parts of the building and adjoining buildings
Comment:		When installed with suitable flanking elements, separating walls incorporating the panels can meet this Requirement. See sections 12.1 to 12.3 of this Certificate.
Requirement:	E2(a)	Protection against sound within a dwelling-house etc.
Comment:		A single-leaf, non-loadbearing partition, incorporating the panel with suitable plasterboard linings can meet this Requirement. See section 12.2 of this Certificate.
Requirement:	L1(a)(i)	Conservation of fuel and power (new buildings)
Comment:		The panels contribute to meeting this Requirement. See sections 7.1 to 7.5, 7.6, 8.1 and 8.2 of this Certificate.
Regulation 7		Materials and workmanship
Comment:		The panels are acceptable. See sections 15.1 and 15.2, and the *Installation* of this Certificate.
Regulation 26		CO_2 emission rates for new buildings
Comment:		The panels will contribute to meeting this Regulation. See sections 7.1 to 7.5, 7.6, 8.1 and 8.2 of this Certificate.

The Building (Scotland) Regulations 2004 (as amended)

Regulation:	8(1)	Fitness and durability of materials and workmanship
Comment:		The panels can contribute to a construction meeting this Regulation. See sections 15.1 and 15.2, and the *Installation* part of this Certificate.
Regulation:	9	Building standards applicable to construction
Standard:	1.1(a)	Structure
Comment:		Walls and roofs incorporating the system panels will have sufficient strength and stiffness when designed and constructed in accordance with sections 6.1 to 6.4 of this Certificate, with reference to clauses 1.1.1[1] and 1.1.2[1] of this Standard.
Standard:	1.2	Disproportionate collapse
Comment:		Walls incorporating the panels will have adequate strength and stiffness to satisfy this Standard with reference to clause 1.1.1[1][2] and, when suitably reinforced, clause 1.2.1[1][2]. See sections 6.1 to 6.4 of this Certificate.
Standard:	2.1	Compartmentation
Standard:	2.2	Separation
Comment:		Walls using the panels with an appropriate lining can achieve a period of fire resistance of 'medium' duration, with reference to clauses 2.2.1[1] to 2.2.3[1] of this Standard. See sections 10.1, 10.5, 10.6 and 10.9 of this Certificate.
Standard:	2.3	Structural protection
Comment:		Walls using the panels with an appropriate lining can achieve a period of fire resistance of 'medium' duration, with reference to clause 2.3.1[1] of this Standard. See sections 10.1, 10.5, 10.6 and 10.9 of this Certificate.
Standard:	2.4	Cavities
Comment:		Walls using the panels with an appropriate cavity barrier can satisfy this Standard, with reference to clauses 2.4.1[1] to 2.4.7[1]. See section 10.6 of this Certificate.
Standard:	2.6	Spread to neighbouring buildings
Comment:		Walls using the panels with an appropriate lining can achieve a period of fire resistance of 'medium' duration, with reference to clause 2.6.1[1] of this Standard. See sections 10.1, 10.5 and 10.6 of this Certificate.
Standard:	3.15	Condensation
Comment:		The panels can adequately limit the risk of surface condensation and will contribute to minimising the risk of interstitial condensation, with reference to clauses 3.15.1[1] to 3.15.4[1] of this Standard. See sections 9.1 and 9.2 of this Certificate.

Standard:	5.1	Resisting sound transmission to dwellings using appropriate constructions
Standard	5.2	Noise reduction between rooms
Comment:		When installed with suitable flanking elements, separating walls incorporating the panels can satisfy this Standard, with reference to clauses 5.1.1[1], 5.1.2[1] 5.1.4[1] and 5.1.6[1]. See sections 12.1 to 12.3 of this Certificate.
Standard:	6.1(b)	Carbon dioxide emissions
Standard:	6.2	Building insulation envelope
Comment:		The panels contribute to meeting these Standards. Refer to clauses 6.1.2[1], 6.1.6[1], 6.2.1[1], 6.2.4[1] and 6.2.5[1]. See sections 7.1 to 7.5, 7.6, 8.1 and 8.3 of this Certificate.
Standard:	7.1(a)(b)	Statement of sustainability
Comment:		The panels can contribute to meeting 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 product 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 7.1 to 7.5 of this Certificate.

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

The Building Regulations (Northern Ireland) 2012

Regulation:	23	Fitness of materials and workmanship
Comment:		The panels are acceptable. See sections 15.1 and 15.2, and the *Installation* part of this Certificate.
Regulation:	29	Condensation
Comment:		The panels will contribute to minimising the risk of interstitial condensation. See sections 9.1 and 9.2 of this Certificate.
Regulation:	30	Stability
Comment:		Walls and roofs constructed from the panels will have sufficient strength and stiffness when designed and constructed in accordance with sections 6.1 to 6.4 of this Certificate.
Regulation:	31	Disproportionate collapse
Comment:		Walls incorporating the panels will have adequate strength and stiffness to satisfy this Standard with reference to clause 1.1.1[1][2] and, when suitably reinforced, clause 1.2.1[1][2]. See sections 6.1 to 6.4 of this Certificate.
Regulation:	35(1)(2)(3)	Internal fire spread — structure
Comment:		The panels can be used in walls required to have a fire resistance of 60 minutes. See sections 10.1, 10.6 and 10.9 of this Certificate.
Regulation:	39(a)(i)	Conservation measures
Regulation:	40(2)	Target carbon dioxide Emissions Rate
Comment:		The panels contribute to meeting these Regulations. See sections 7.1 to 7.4, 7.6, 8.1 and 8.2 of this Certificate.
Regulation:	49	Protection against sound from other parts of the building and from adjoining buildings
Comment:		When installed with suitable flanking elements, separating walls incorporating the panels can meet this Regulation. See sections 12.1 to 12.3 of this Certificate.

Construction (Design and Management) Regulations 2007

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

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

See sections: 1 *Description* (1.1) and 4 *General* (4.1 and 4.2) of this Certificate.

Additional Information

NHBC Standards 2014

NHBC accepts the use of the SIP Energy Loadbearing Wall and Roof Panels, when installed, used and maintained in accordance with this Certificate, in relation to *NHBC Standards*, Part 6, Chapter 6.2 *External timber framed walls* and Part 7, Chapter 7.2 *Pitched roofs*.

Technical Specification

1 Description

1.1 The SIP Energy Loadbearing Wall and Roof Panels comprise an extruded polystyrene insulation core bonded with polyurethane adhesive to oriented strand board (type OSB/3) sheathing on both sides with solid timber top, bottom and edge plates. The panels have the nominal characteristics given in Table 1.

Table 1 SIP Loadbearing Wall and Roof Panels — specification

Aspect	Dimensions/detail
Overall thickness (mm)	130 to 230
OSB/3 thickness (mm)	15
XPS Insulation thickness (mm)	100 to 200
Overall size (width by height) (m) Standard panel Large panel	 1.2 x <3 15 x <3
Weight (kg·m^{-2})	25 – 29
Edge detail	Rebated to receive splines

1.2 Details of the panel components are:

- external sheathing — 15 mm thick, Type 3 (OSB/3) oriented strand board to BS EN 300 : 2006
- insulation core — extruded polystyrene (XPS) with a compressive strength of 300 kN·m^{-2}
- softwood timber inserts — grade C16, C18 and C24, to top, bottom and vertical edges
- internal timber studs — 100 mm to 200 mm by 45 mm at 1200 mm centres C24 kiln dried timber
- splines — 15 mm by 100 mm OSB/3 connectors located in preformed rebates within the XPS core or timber inserts to connect adjacent standard panels
- bonding — polyurethane adhesive used between sheathing and core.

1.3 Ancillary items used with the panels include:

- sole plate —130 mm to 230 mm by 45 mm minimum deep, C24 treated timber to BS EN 338 : 2009, used to support the bottom channel (see BS 8417 : 2011 for required hazard class)
- head and bottom plate — 100 mm to 200 mm by 45 mm C18 kiln dried timber
- lintels — kiln dried timber C18 to C24 grade timber depending on opening size
- framing for openings — 100 mm to 200 mm by 45 mm C18 kiln dried timber
- fasteners — 2.8 mm diameter by 63 mm long nails used in conjunction with panel connector splines and fixed at 75 mm centres
- galvanized/sherardized ring-shank nails — 2.8 mm diameter by 63 mm long in accordance with BS 5268-2 : 2002 or BS EN 1995-1-1 : 2004 used at 75 mm centres, to secure panel vertical joints together and panel to sole plate
- flathead fasteners — to one specification, typically 4.8 mm diameter by 250 mm long for joining larger panels together.

1.4 Other items used, but outside the scope of this Certificate, include:

- Purlins and support beams — typically timber, steel or glulam to structural design requirements
- joist hangers and fixings — as specified for the project
- joists and fixings — as specified on a project basis
- dry lining battens — minimum 38 mm wide by 11 mm deep softwood, OSB/3 or vertical metal rails
- polyurethane adhesive/sealant to seal panel joints to sole plates
- expanding urethane — gun-grade polyurethane based expanding one-part foam
- wall ties — typically at 600 mm centres horizontally and 450 mm vertically
- counter battens — treated softwood counter battens, minimum 50 mm wide by 25 mm deep
- tiling/slate battens — sizing as per BS 5534 : 2003
- vapour permeable membrane — for use as a roof tile underlay
- breather membrane — for use on the external cavity face of the panel
- damp-proof membrane — a for use in wall construction
- cavity barriers — approved for use in wall construction
- anchor bolts — for securing sole plate to foundation, to structural design requirements
- holding down straps — typically galvanised steel and approved for use in wall construction.

2 Manufacture

2.1 The manufacturing process includes cutting to size, forming of openings, joint rebating (for insertion of spline pieces), bevelling, hole drilling. The OSB/3 skins are bonded to the XPS foam core and timber plates and studs as part of the factory and delivered on site as a completed panel.

2.2 To ensure product quality is consistently maintained to the required specification, the BBA has:

- agreed with the Certificate holder/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 non-conformities
- checked that equipment has been properly tested and calibrated
- undertaken to carry out the above measures on a regular basis as part of a surveillance process to ensure that standards are maintained and that the product or system remains as Certificated.

3 Delivery and site handling

3.1 The panels are delivered either in horizontal stacks or vertically in a purpose made steel frame. Once on site they should be stored on flat ground no more than eight panels high supported on, typically, 75 mm by 100 mm timber packing pieces to keep panels above ground surface level.

3.2 Components, such as fixings and OSB splines, should be stored inside, or in dry, sheltered conditions at least 150 mm off the ground, covered with opaque polythene sheeting or tarpaulin until the panels and components are to be used for erection.

3.3 The panels can withstand the normal loads associated with site handling and installation. Damaged panels should not be used.

Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on SIP Energy Loadbearing Wall and Roof Panels.

Design Considerations

4 General

4.1 SIP Energy Loadbearing Wall and Roof Panels are suitable for use as the loadbearing inner leaf of external walls, internal loadbearing partitions, separating walls and in pitched roofs in dwellings up to three storeys high (a maximum height of three metres per storey). The panels may also be used as wall infill panels to multi-storey framed buildings subject to design constraints on height, fire requirements (see section 10.9), loading and the method of fixing to the structural frame.

4.2 All structural calculations should be undertaken by a by a suitable qualified and experienced individual who should contact the Certificate holder for full design guidance. All production drawings should be carried out by the Certificate holder or approved designers.

4.3 The cutting or forming of openings within wall or roof panels must be taken into account, in particular to the loadbearing capacity of individual elements and overall stability of the structure.

4.4 When panels are used to construct the inner leaf of an external cavity wall, the outer masonry leaf and all masonry below the damp-proof course (dpc) must be built in accordance with BS EN 1996-1-2 : 2005 or BS 5628-3 : 2005 and roof tiles and slates applied in accordance with BS 5534 : 2003. When used as an infill panel all fixings must be designed to allow movement within the structural frame due to expansion/contraction or differential movement.

4.5 All foundations must be approved for use by the Certificate holder's technical staff and should be suitably level and square to accept the wall panel.

5 Practicability of installation

5.1 The product should only be installed by installers who have been trained and approved by the Certificate holder.

6 Strength and stability

6.1 The wall and roof panels will have adequate strength and stiffness when used in accordance with the provisions of this Certificate. When using the panels building designers must take account of the long-term creep effects of permanent loading and cracking to internal finishes.

6.2 The maximum unfactored load that can be used when evaluating the vertical resistance of 130 mm, 155 mm and 180 mm thick wall panels up to 3 m high is 50 $kN{\cdot}m^{-1}$ when axially loaded. When considering fire resistance requirements designers should also take note of the axial loading stated in section 10.1 of this Certificate.

Note: This value given is for medium term loads based on an interpretation of three test results (to failure) on a 130 mm thick panel using the methods given in BS 5268-2 : 2002, Section 8. In carrying out structural design calculations for individual buildings account must also be taken of the reduction in axial load capacity that will occur when the panel is also subject to eccentric and transverse loading. Values shown assume a service deflection limit of span/350. Account should also be taken of any limitations that may be imposed due to fire resistance (see section 10).

6.3 Permissible transverse load values to be used when evaluating the design resistance of the panels are given in Table 2. The values are based on test results carried out on a 130 mm and 230 mm thick SIP with 15 mm OSB/3 skins and analysis carried out in accordance with BS EN BS EN 1995-1-1 : 2004.

Table 2 Service and permissible transverse load for 130 mm, 155 mm,180 mm, 205 mm and 230 mm thick roof panels[1]

Panel thickness (mm)	Span type (mm)	Span length (mm)	Service load[2] at L/360 deflection ($kN \cdot m^{-2}$)	Service load[2] at L/250 deflection ($kN \cdot m^{-2}$)	Service load[2] at L/180 deflection ($kN \cdot m^{-2}$)	Max permissible load ($kN \cdot m^{-2}$) allowed applying a factor of safety of 2.25[3]
130	Single	2350	4.20	6.00	8.19	8.19
155	Single	2350	5.12	7.38	10.22	10.22
180	Single	2350	6.39	9.19	12.22	12.22
205	Single	2350	8.00	11.53	13.00	14.00
230	Single	2350	10.63	15.29	16.32	16.32
130	Single	4100	0.84	1.20	1.64	2.73
155	Single	4100	0.96	1.39	1.93	3.32
180	Single	4100	1.20	1.73	2.40	3.84
205	Single	4100	1.51	2.17	3.02	4.40
230	Single	4100	2.44	3.49	4.77	5.10

(1) These loads are the result of short-term loading tests on panels with 15 mm OSB/3 skins with 45 mm wide by core depth C24 intermediate studs at 1200 mm centres. When assessing deflections, the engineer must take into account simple bending, shear deflection and creep effects. Further design advice can be obtained from the Certificate holder's design guide.

(2) The design engineer must also take into account simple bending, shear deflection and creep effects when assessing long-term deflection.

(3) Factor of safety including load and material factor.

6.4 In the design of buildings account must be taken of sliding, overturning and panel racking. The methods given in BS EN 1995-1-1 : 2004 or BS 5268-6.1 : 1996 may be used to assess racking resistance. Based on testing carried out by the Certificate holder using the methods described in BS 5268-6.1: 1996, clause 4.7.2(b), a basic racking resistance[1][2] of 3.38 $kN \cdot m^{-1}$ for the wall panel thickness range can be assumed. The number and size of openings within the installed panels together with any changes to method of fixing to the sole plate and in turn, the sole plate to the foundation, will affect this figure. The suitable qualified and experienced individual must take these items into account when producing stability calculations.

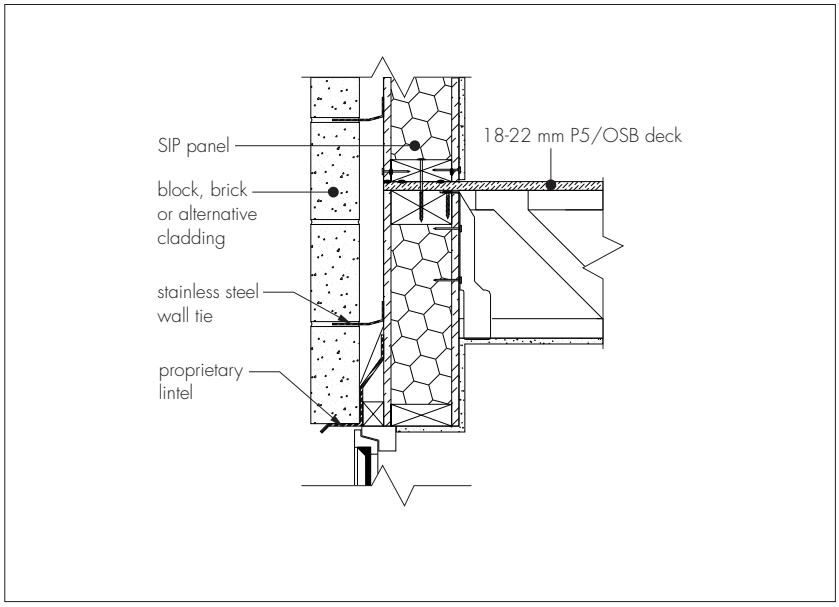
(1) Racking resistance testing was carried out on the 130 mm thick panel. The basic racking resistance value assumes that the OSB skins are bonded to the XPS infill and nailed to the sole plate using 50 mm long by 3.3 mm wire nails at 100 mm centres. Anchor bolts for fixing the sole plate to the test rig for the racking resistance tests were 12 mm diameter at 600 mm centres. Any changes to this assumption will affect the figure and the design engineer should modify the basic racking resistance accordingly. Alternatively, the design engineer should adopt the basic racking resistance values set out in BS 5268-6.1 : 1996, Table 2.

(2) The basic racking resistance value may be modified by factors K_{104} to K_{108} in accordance with BS 5268-6.1 : 1996 to obtain the permissible racking resistance value.

6.5 The strength of all connection details which tie walls to other structural elements (such as walls, floors, roofs, OSB splines) must be evaluated and provide adequate stability for the overall building design. The specification and design for these items must be determined by the person responsible for the stability of the building. Guidance on the design of connection details may be obtained from the Certificate holder.

6.6 Lintels and framing around openings, form an integral part of the loadbearing wall panels (see Figure 1). The sizing of lintels must be determined by suitable qualified and experienced individual responsible for the design.

Figure 1 Typical lintel detail



6.7 As part of the structural design, consideration should be given to the support of eccentric loads imparted by heating systems or other large objects supported directly off the wall or roof panels.

6.8 Stainless steel wall ties, typically type 5 or 6 to BS DD 140-2 : 1987, can be directly attached to the OSB/3 face of the panel using stainless-steel screw fasteners. The Certificate holder is able to provide pull-out test data on request.

7 Thermal performance

7.1 The thermal performance of each building incorporating the system must be evaluated in accordance the relevant national Building regulations and is the responsibility of the overall designer of the building.

7.2 Calculations of the thermal transmittance (U value) for a particular wall construction can be carried out in accordance with the 'combined method' in BS EN ISO 6946 : 2007 and BRE report 443 : 2006. The following thermal conductivity $\lambda_{90/90/Declared}$ *values* ($W \cdot m^{-1} \cdot K^{-1}$) may be used to conduct a 'combined method' calculation:

XPS 0.033

OSB/3 0.130.

7.3 The overall U value will depend on the construction adopted (see section 7.5).

7.4 Junctions with other elements should be designed to limit heat loss. Detailed guidance in this respect 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(1)

Northern Ireland — Accredited Construction Details (version 1.0).

(1) Flexible approaches on existing buildings are given in the Technical Handbooks.

7.5 Typical U values for building elements, calculated in accordance with BS EN ISO 6946 : 1997 and BR 443 : 2006 are given in Table 3.

Table 3 Typical U values for 180 mm thick panels

Element	U value ($W \cdot m^{-2} \cdot K^{-1}$)
External wall(1)	0.21
Roof(2)	0.19

(1) Construction consisting of 12.5 mm standard plasterboard, 180 mm thick panel, breather membrane, 50 mm cavity ventilation and 103 mm brick outer leaf.

(2) Construction consisting of 205 mm thick panel, a 50 mm ventilated air layer and roof tiles.

8 Air permeability

8.1 SIP Energy Loadbearing Wall and Roof Panels will contribute to buildings achieving the required BER or DER. Care should be taken in project detailing and workmanship to ensure interfaces with other features do not adversely affect the building's overall air leakage performance.

8.2 In England, Wales and Northern Ireland, completed buildings are subject to pre-completion testing for airtightness in accordance with the requirements of Approved Documents L1A and L2B (section 20A), Technical Booklet F1 (sections 2.59 to 2.69) and Technical Booklet F2 (sections 2.72 to 2.77) respectively.

8.3 In Scotland, completed dwellings are subject to testing air permeability in accordance with the requirements of Mandatory Standard 6.2 (clause 6.2.5). Alternatively, where a default design value of 15 $m^3 \cdot m^{-2} \cdot h^{-1}$ at 50 Pa is stated in demonstrating compliance under Mandatory Standard 6.1, testing is not required.

9 Condensation risk

Surface condensation

9.1 The risk of surface condensation in roofs and external walls, and at junction and opening details will be minimal.

Interstitial condensation

9.2 The risk of interstitial condensation will be minimal when the panels are used in conjunction with a vapour check plasterboard lining, or other suitably installed vapour control layer. For the purposes of calculating condensation risk, in accordance with BS 5250 : 2002, vapour diffusion factors (μ) of 60 may be used for the external and internal OSB/3 skins respectively.

10 Behaviour in relation to fire

10.1 When tested to BS EN 1365-1: 1999, the panel system achieved the results shown in Table 4.

Table 4 Fire performance

Performance	Axial load ($kN \cdot m^{-1}$)	Applied load (kN)	Construction
FR30	12.5	37.5	12.5 mm type 1 plasterboard fixed directly to the exposed face of a 3000 mm by 3000 mm by 130 mm thick panel.
FR90	12.5	37.5	Two layers of 15 mm thick Lafarge Echeck wallboard fixed directly to the exposed face of a 3000 mm by 3000 mm by 130 mm thick panel.

10.2 Assessment of test results and design details shows that panels are suitable for use in external walls (with service loads up to the stated values in Table 4), not less than one metre from a relevant boundary, and in separating walls that require fire resistance periods not less than:

- external walls 30(1) or 60(2) minutes (from inside)(2)(3)
- separating walls minimum 60 minutes (from one side)(2).

(1) 'Short' duration in Scotland.

(2) 'Medium' duration in Scotland.

(3) Based on testing in accordance with BS EN 1365-1:1999 with an applied load of 12.5 $kN \cdot m^{-1}$ across the panel

10.3 The OSB/3 panel linings have a Class 3(1) surface spread of flame designation.

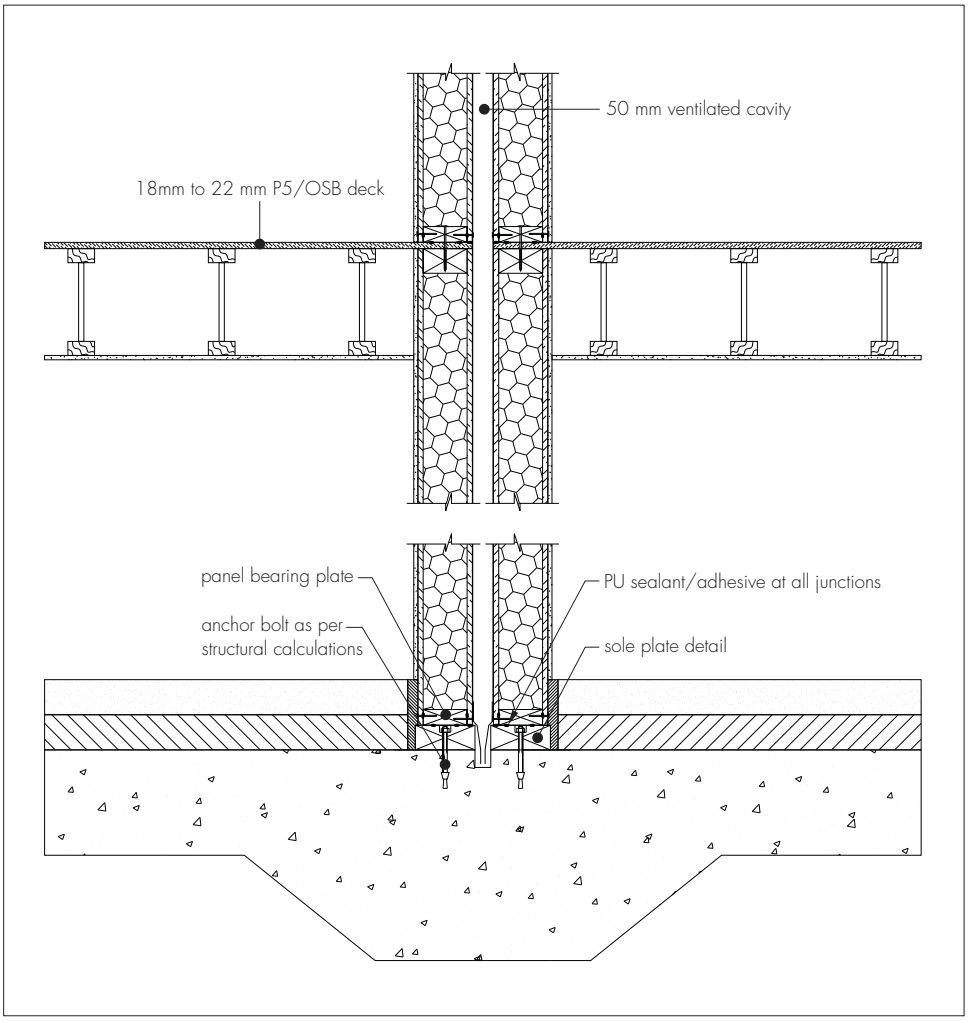
(1) 'High risk' in Scotland.

10.4 Junctions between the panels in external and separating walls will adequately maintain the fire resistance of the separating wall.

10.5 The panels can form part of a separating wall (see Figure 2) between dwellings in Scotland in accordance with the exceptions permitted by Mandatory Standard 2.2, with reference to clause 2.2.7(1).

(1) Technical Handbook (Domestic).

Figure 2 Typical separating wall detail



10.6 Constructions incorporating the wall and roof panels must include suitable provision for cavity barriers and for fire stopping at junctions with other elements. The maximum distance between cavity barriers, both vertically and horizontally must be accordance with the Mandatory Standard 2.4.

10.7 Where a greater load capacity to that given in Table 3 or where any other form of wall construction incorporating the panels (including any service penetrations) is subject to fire-resistance requirements, an appropriate assessment or test must be carried out by a UKAS (United Kingdom Accreditation Service) approved testing laboratory.

10.8 The external fire rating of any roof incorporating the system panels will depend on the specification of the roof covering used.

10.9 When used as infill panels in multi-storey buildings designers should note the requirements set out in Approved Documents in England and Wales and Northern Ireland that all materials used in the cavity above 18 m must be of limited combustibility, or non-combustible in Scotland. Buildings above 18 m in height should be designed and constructed in accordance with the recommendations of BRE Report BR 135 : 2003.

11 Proximity of flues and appliances

When installing the product in close proximity to certain flue pipes and/or heat producing appliances, the following provisions of the national Building Regulations are applicable:

England and Wales — Approved Document J

Scotland — Mandatory Standard 3.18, clauses 3.18.1(1) to 3.18.6(1)

Northern Ireland — Technical Booklet L.

(1) Technical Handbook (Domestic)

12 Resistance to airborne sound

12.1 In England and Wales, separating walls are subject to pre-completion testing in accordance with Approved Document E, Section 1. A similar approach is described in the Scottish Building Standards, section 5.1.2(1) and the Building Regulations (Northern Ireland), Document G.

12.2 Acoustic testing should be carried out on completed buildings in accordance with the relevant Building Regulations as follows:

England and Wales — Approved Document E, Section 1

Scotland — Mandatory Standard 5.1, clause 5.1.9,

Northern Ireland — Technical Booklet G.

(1) Technical Handbook (Domestic).

12.3 Test data in accordance with BS EN ISO 140-4 : 1998 and BS EN ISO 717 : 1997 indicate that the separating wall construction(1) detailed in Figure 3 can provide satisfactory resistance to airborne sound transmission, when used in conjunction with suitable flanking elements.

(1) Separating wall construction:

- 2 x 15 mm acoustic plasterboard (minimum mass 10 kg·m^{-2}) with all joints staggered and skimmed and taped
- 130 mm thick SIPS panel
- 100 mm clear cavity
- 130 mm thick SIPS panel
- 2 x 15 mm acoustic plasterboard (minimum mass 10 kg·m^{-2}) with all joints staggered and skimmed and taped.

12.4 It is essential that care is taken in design and during installation to avoid direct paths for airborne sound transmission and to minimise paths for flanking sound transmission.

13 Weathertightness

13.1 When the panels are used to form the inner leaf of an external cavity wall, the outer masonry leaf must be designed and constructed in accordance with BS EN 1996-1-2 : 2005 or BS 5628-3 : 2005 or incorporating damp-proof courses and cavity trays positioned in accordance with the latter code. A breather membrane is required with this type of construction.

13.2 When used with other outer leaf construction, cladding or render systems the final weather resistance of the building is dependent upon the efficient positioning and sealing of all joints. The guidance given in BRE Report 262 : 2002, Section 3, should be followed with regard to rain penetration in that the designer selects a construction appropriate to the local wind-driven rain index, paying due regard to the design detailing, workmanship and materials to be used.

13.3 Roofing should be in accordance with BS 5534 : 2003 detailed to ensure moisture is prevented from coming into contact with the panels.

13.4 The performance of windows and doors is not covered by this Certificate.

13.5 The requirements set out in NHBC Standards for minimum cavity widths between wall panel outer face and external finishes should be noted and adhered to.

14 Maintenance and repair

Although maintenance is not envisaged for the panels, regular checks should be carried out on the finishes to ensure that any damage is detected and repaired as soon as possible.

15 Durability

15.1 The panels will have comparable durability to that of OSB/3 to BS EN 300 : 2006. Therefore, provided the installation remains weathertight and damp proof courses are properly detailed, a life of at least 60 years may be expected.

15.2 Timber used in areas that could be at risk (eg sole plates), must be preservative-treated in accordance with the recommendations given in BS 8417 : 2011.

Installation

16 General

16.1 Erection of the SIP Energy Loadbearing Wall and Roof Panels must comply with the details (see Figure 3) given in the Certificate holder's Construction Manual and the provisions of this Certificate.

16.2 The main contractor must ensure that the accuracy of the foundation is in accordance with the Certificate holder's instructions, in particular, the following details must be within the tolerance of ± 5 mm:

- level of the foundation or other bearing support
- overall width and length of the building footprint
- diagonals used for checking the overall squareness of the building.

16.3 When used as an infill panel, the main contractor must ensure that the accuracy of the structural frame is in accordance with the Certificate holder's acceptable tolerances.

16.4 Guidance to the procedure for installing the infill panels is limited due to the variations in the structural frame construction and detailing. Erection methods for lifting infill panels into place, specification and design brackets, fixings and tolerances to allow for expansion and movement will therefore need to be determined by the designer for each structure in which the infill panels are used. Gaps are filled with expanding urethane foam or proprietary compressible foam. Further guidance can be obtained from the Certificate holder. A typical fixing arrangement is shown in Figure 4).

Figure 3 Typical construction details — wall, roof and infill panels

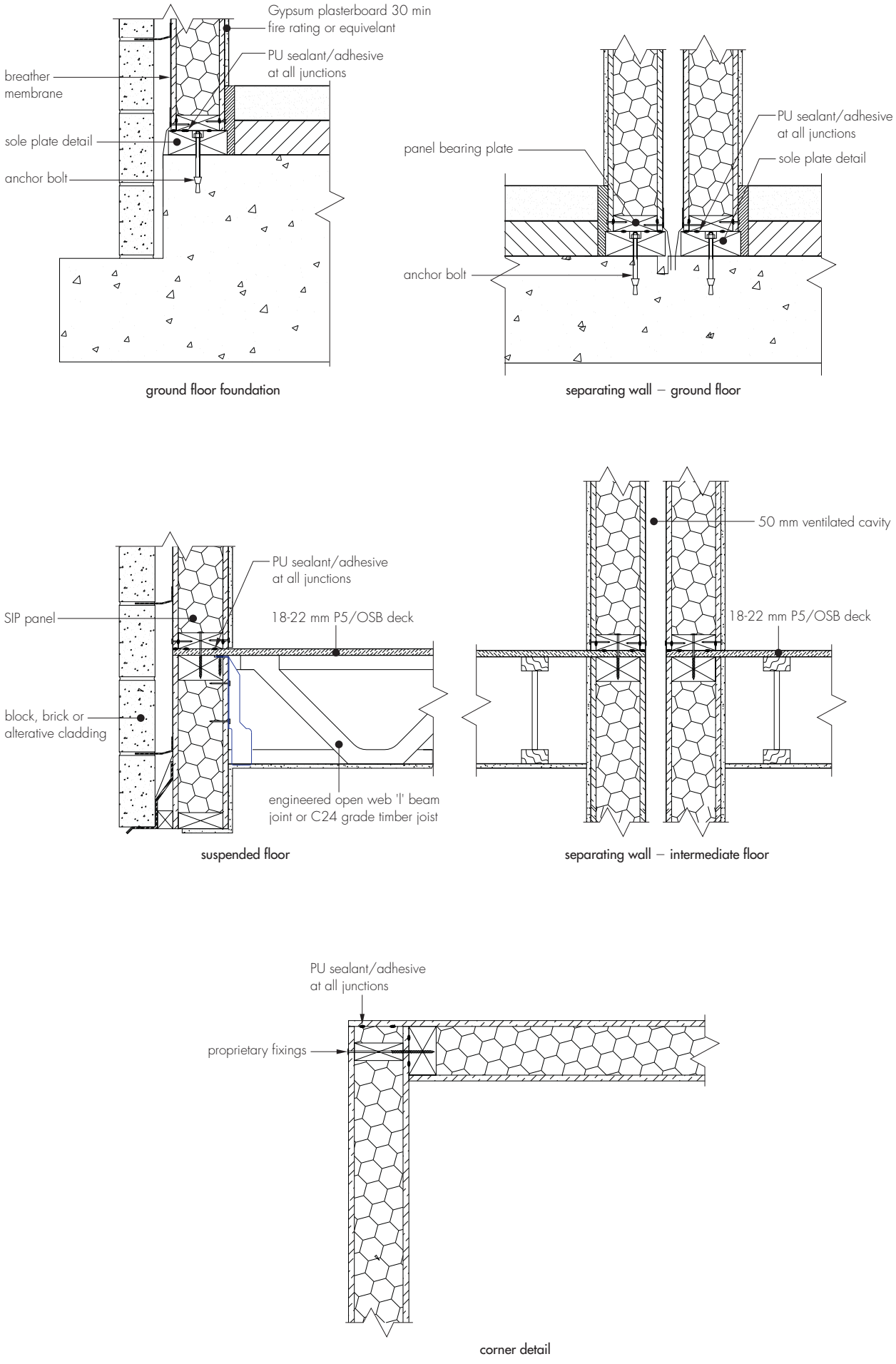
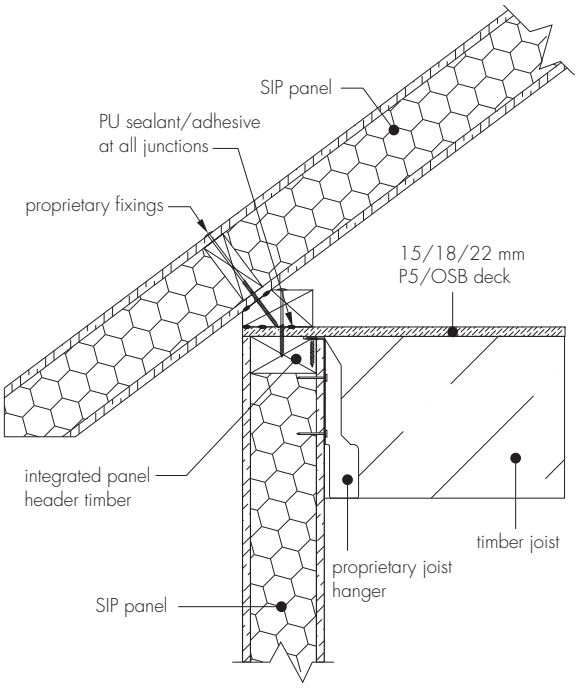
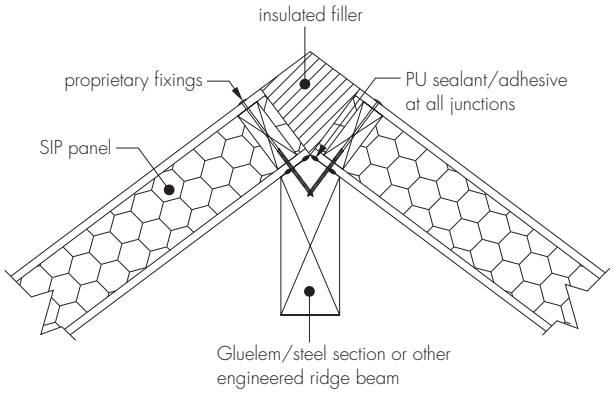


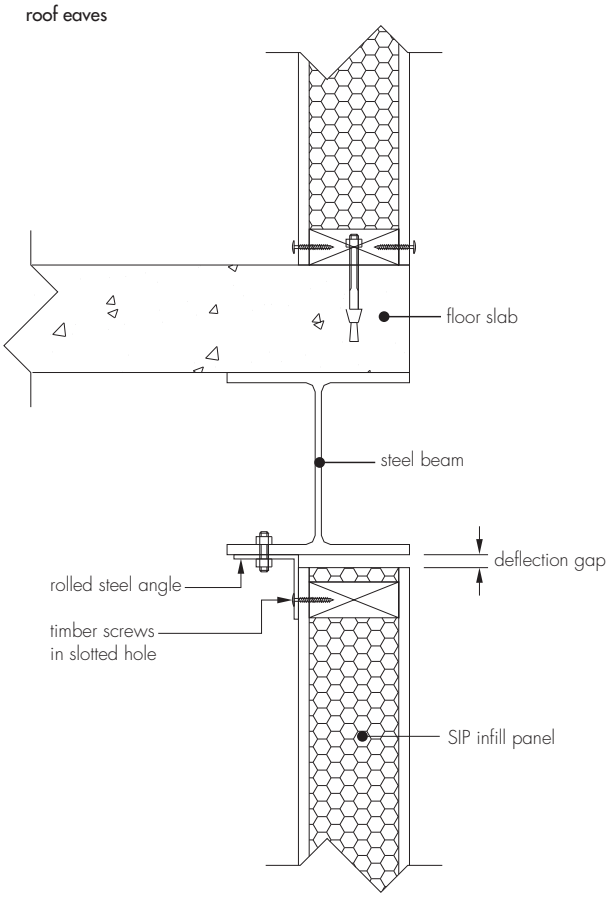
Figure 3 Typical construction details — wall, roof and infill panels (continued)



roof eaves



roof ridge



infill panel

17 Procedure

Foundations

17.1 A suitable damp-proof course (dpc) is laid on top of the foundation.

17.2 A treated timber sole plate is positioned over the dpc and fixed to the foundation using fixings as approved by the Certificate holder. Typically, a holding down bolt arrangement should be used for securing into a concrete raft foundation or masonry. Sole plates can be adjusted using shims and proprietary injectable mortar grouting is introduced to seal against air infiltration, if required.

Ground-floor construction

17.3 Two beads of urethane sealant are run along the top of the sole plate and the bottom plate, with chamfered top edges, secured to the sole plate using galvanized ring-shank nails or screws at centres approved by the Certificate holder. Runs of sealant are then applied to the sides of the bottom plate. Starting at one corner, the first panel is positioned correctly onto the bottom plate, plumbed vertical and fixed to the bottom plate section with galvanized ring-shank nails or screws at centres approved by the Certificate holder, through the OSB inner and outer skins. This forms the standard basis for connecting all ground-floor panel runs or corner junctions. Panels are temporarily braced to maintain stability. Wall panels are assembled using a spline joint connection. All vertical joints are sealed using urethane sealant. Spline joints of the panel can be tightened using a timber mallet taking care not to damage OSB edges.

First and second floor and room-in-roof construction

17.4 Engineered or traditional timber floor joists are supported either from the head of the wall panel or side of the panel using joist hangers, fixed by nailing into the head plate using galvanized ringshank nails or screws approved by the Certificate holder.

17.5 A 40 mm deep timber bottom plate is nailed through the floor decking into the head plate or rim beam. The procedure used for the ground-floor construction is followed.

Roof construction

17.6 The external and internal top floor walls are stiffened through the use of intermediate/ridge beams/purlins as per design requirements. Structural elements are located within preformed pockets in the wall panel. A wall plate is fixed onto the top of the head plate with the top angled to suit the pitch of the roof.

17.7 Roof panels are positioned working from one gable wall to the other. Panels are joined (as for the wall construction) and fixed through to the structural supporting timber members using the Certificate holder's approved screw fasteners and to the engineer's design requirements. The roof panel is overlaid with a vapour permeable membrane. Treated softwood counter battens are then fixed through to the roof panel using screws as approved by the Certificate holder and to the engineer's design requirements. A variety of roof finishes can be adopted, subject to Certificate holder's approval.

Technical Investigations

18 Tests

Bending tests were carried out in accordance with BBA test specification.

19 Investigations

19.1 An examination was made of technical data relating to:

- racking resistance in accordance with BS 5268-6.1 : 1996 and BS EN 594 : 1996
- concentric vertical loading
- fire-resistance to BS EN 1365-1: 1999
- structural properties and design calculations
- airborne sound insulation tests
- air leakage tests.
- pull-out strength of fixings

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

19.3 A visit was made to a site in the UK to assess the installation process.

Bibliography

BS 5250 : 2002 *Code of practice for control of condensation in buildings*

BS 5268-2 : 2002 *Structural use of timber – Code of practice for permissible stress design, materials and workmanship*

BS 5268-6.1 : 1996 *Structural use of timber — Code of practice for timber frame walls — Dwellings not exceeding seven storeys*

BS 5534 : 2003+A1 : 2010 *Code of practice for slating and tiling (including shingles)*

BS 5628-3 : 2005 *Code of practice for the use of masonry — Materials and components, design and workmanship*

BS 8417 : 2011 *Preservation of wood — Code of practice*

BS EN 300 : 2006 *Oriented strand boards (OSB) — Definitions, classification and specifications*

BS EN 338 : 2009 *Structural timber — Strength classes*

BS EN 594 : 1996 *Timber structures — Test methods — Racking strength and stiffness of timber frame wall panels*

BS EN 1365-1:2012 *Fire resistance tests for loadbearing elements — Walls*

BS EN 1995-1-1 : 2004+A1 : 2008 *Eurocode 5 — Design of timber structures — General — Common rules and rules for buildings*

BS EN 1995-1-2 : 2004 *Eurocode 5 — Design of timber structures — General — Structural fire design*

BS EN 1996-1-2 : 2005 *Eurocode 6 — Design of masonry structures — General rules — Structural fire design*

BRE Report 262 : 2002 *Thermal insulation : avoiding risks*

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

BS EN ISO 140-3 : 1995 *Acoustics — Measurement of sound insulation in buildings and of building elements — Laboratory measurement of airborne sound insulation of building elements*

BS DD 140-2 : 1987 *Wall ties — Recommendations for design of wall ties*

BS EN ISO 717 : 1997 *Acoustics — Rating of sound insulation in buildings and of building elements — Airborne sound insulation*

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

20 Conditions

20.1 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.

20.2 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.

20.3 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.

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

20.5 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.

20.6 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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