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BBA APPROVAL INSPECTION TESTING CERTIFICATION
TECHNICAL APPROVALS FOR CONSTRUCTION

Agrément Certificate
06/4312
Product Sheet 1

SIP BUILDING SYSTEMS

SIP LOADBEARING WALL AND ROOF PANELS

This Agrément Certificate Product Sheet(1) relates to SIP Loadbearing Wall and Roof Panels, structural insulated panels for use above the damp-proof course in domestic applications up to two storeys high (plus room-in-roof) as the loadbearing inner leaf of an external cavity wall or as part of separating walls, internal loadbearing walls and pitched roofs.

(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: 6 September 2013

Originally certificated on 20 April 2006

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 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 and 6.2 of this Certificate.
Requirement:	B3(1)(2)(3)	Internal fire spread (structure)
Comment:		The panels, with appropriate lining, can be used in walls required to have a fire resistance in excess of 60 minutes. See sections 10.1 to 10.3 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, 9.2, 13.1 and 13.2 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 suitable plasterboard linings, can meet this Requirement. See section 12.2 of this Certificate.
Requirement:	L1(a)(i)	Conservation of fuel and power (New dwellings)
Comment:		The panels contribute to meeting this Requirement. See sections 7.1, 7.2, 8.1 and 8.2 of this Certificate.
Regulation:	7	Materials and workmanship
Comment:		The panels are acceptable. See section 15.1 and the *Installation* of this Certificate.
Regulation:	26	CO_2 emission rates for new buildings
Comment:		The panels contribute to meeting this Requirement. See sections 7.1 and 7.2 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 section 15.1 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 and 6.2 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 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 and 6.2 of this Certificate.
Standard:	2.1	Compartmentation
Standard:	2.2	Separation
Comment:		Walls using the 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 10.4 and 10.5 of this Certificate.
Standard:	2.3	Structural protection
Comment:		Walls using the 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, 10.2 and 10.4 of this Certificate.
Standard:	2.4	Cavities
Comment:		Walls using 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 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 to 10.4 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	Noise separation
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, 7.2, 8.1 and 8.3 of this Certificate.
Standard:	**7.1(a)(b)**	**Statement of sustainability**
Comment:		The product 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 sections 7.1 and 7.2 of this Certificate

(1) Technical Handbook (Domestic).

The Building Regulations (Northern Ireland) 2012

Regulation:	**23**	**Fitness of materials and workmanship**
Comment:		The panels are acceptable. See section 15.1 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 and 6.2 of this Certificate.
Regulation:	**31**	**Disproportionate collapse**
Comment:		Walls will have adequate strength and stiffness to satisfy this Standard. See sections 6.1 and 6.2 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 to 10.3 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, 7.2, 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 2013

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

Technical Specification

1 Description

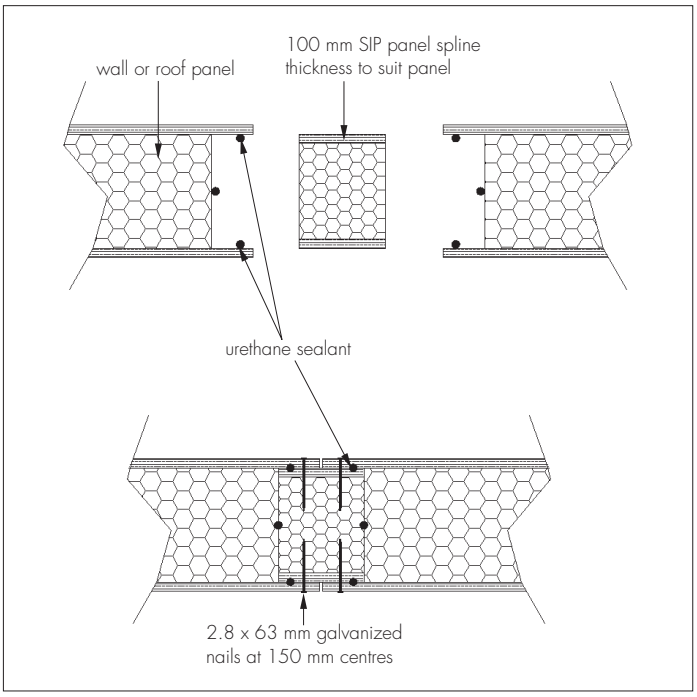
1.1 The SIP Loadbearing Wall and Roof Panels, is a system of construction using structural insulated panels manufactured from OSB/3 and rigid polyurethane insulation. The elements consist of internal and external skins of oriented strand board, Type 3 (OSB/3) to BS EN 300 : 2006, with an insulation core of closed cell polyurethane (PUR). Panel specifications are shown in Table 1.

Table 1 SIP Loadbearing Wall and Roof Panels — Specification

Characteristic (unit)	Value/type
Overall thickness (mm)	75 to 250
OSB thickness (mm)	12 (11, 15 and 18 optional)
Insulation thickness (mm)	53 to 226
Insulation density (kg·m^{-3})	38 to 45
Maximum length (m)	1.22 x 6.25
Weight (kg·m^{-2})	18 to 28
Edge	Rebated, square

1.2 The panels are connected by the use of panel splines located in preformed rebates within the PUR core or timber inserts (see Figure 1). Openings are formed with pre-cut panels incorporating timber lintels (see section 6.6).

Figure 1 Typical detail of spline connection



1.3 Ancillary items used with the panels include:

- sole plate — 75 mm to 250 mm by 38 mm deep, C24 treated timber to BS EN 338 : 2009, used to support the bottom channel (see BS 8417 : 2011 for required hazard class)
- bottom and top plate — 53 mm to 228 mm by 38 mm C16 minimum timber with chamfered top edges
- edge timber — minimum 38 mm by 76 mm, grade C16 timber
- lintels — treated softwood timber to Structural Engineer's design
- framing for openings — treated softwood timber to grade C16
- galvanized/sherardized ring-shank nails — in accordance with BS 5268-2 : 2002 or BS EN 1995-1-1 : 2004 and in sizes of 2.8 mm diameter by 63 mm and 3.75 mm diameter by 75 mm.

1.4 Other items used in the wall and roof construction, but outside the scope of this Certificate, include:

- Glulam purlins
- standard nails — in accordance with BS 5268-2 : 2002 or BS EN 1995-1-1 : 2004
- joist hangers — as specified for the project; fixings to be to the Certificate holder's instructions
- joists — as specified for the project; fixings to be to the Certificate holder's instructions
- dry lining battens — minimum 38 mm wide by 11 mm deep softwood, OSB/3 or vertical metal rails
- silicone — one-part transparent silicone of density >1020 $kg \cdot m^{-3}$, permissible deformation >25%, UV and fungal resistant
- expanding urethane — Apollo A71510 gun-grade polyurethane based expanding one-part foam
- wall ties — Simpson Strong-tie BTS4 TEK wall-tie kits using ABC Spax stainless steel, flange-head, Pozi-drive screws 4 mm diameter by 30 mm in length
- counter battens — treated softwood, minimum 50 mm wide by 25 mm deep
- tiling/slate battens — sizing as per BS 5534 : 2003
- vapour permeable membrane — use as a roof tile underlay
- breather membrane — approved for use in wall construction
- screws — zinc plated wood screws, as specified by suitable qualified and experienced individual, in accordance with BS EN 1995-1-1 : 2004 or BS 5268-2 : 2002.

2 Manufacture

2.1 The polyurethane (PUR) foam is bonded to OSB/3 skins in a 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 nonconformities
- 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 in shrink-wrap, with edge protectors and banded packaging used for initial transit and temporary protection. Each panel should be stored flat (no more than 10 panels high for up to 125 mm thickness, 8 high for 150 mm thickness and 5 high for 250 mm thickness) over suitable stillage to a slight fall (to allow rain run-off). Bearers should be at 600 mm (maximum) centres (end bearers not more than 150 mm from edge of panel), and aligned vertically between individual packs in accordance with the Certificate holder's guidelines.

3.2 The components should be stored inside, or in dry, sheltered conditions at least 150 mm off the ground, covered with opaque polyethylene 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 Loadbearing Wall and Roof Panels.

Design Considerations

4 General

4.1 SIP Loadbearing Wall and Roof Panels are suitable for use as loadbearing partitions, separating walls, the inner leaf of external walls and pitched roofs in dwellings up to two storeys high (plus room-in-roof). All structural calculations should be undertaken by a suitably 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.

4.2 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.

4.3 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 5628-3 : 2005 or BS EN 1996-2 : 2006 and roof tiles and slates applied in accordance with BS 5534 : 2003.

4.4 Foundations (outside the scope of this Certificate) 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

The product should only be installed by competent builders 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.

6.2 The maximum permissible design values(1) that can be used when evaluating the vertical resistance of 100 mm thick wall panels with 12 mm OSB/3 skins up to 3 m high are:

- 64(2) $kN \cdot m^{-1}$ when axially loaded
- 53(2) $kN \cdot m^{-1}$ when eccentrically loaded by not more than 25 mm from the centre line of the panel.

(1) The values given are for medium-term loads and are based on two sets of tests to failure of six panels using the methods given in BS 5268-2 : 2002, Section 8. Data for other panel configurations are available on request. The engineer must take into account the reduction in axial load capacity that will occur when the panel is also subject to transverse loading such as wind. The values also assume a serviceability deflection limit of span/333.

(2) Subject to 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 150 mm thick SIP with 12 mm OSB/3 skins and analysis carried out in accordance with BS 5268-2 : 2002.

Table 2 Permissible transverse load for 150 mm thick roof panels(1)

Span condition	Load at span/333(2) ($kN \cdot m^{-2}$)	Admissible load with FOS(3) of 2.25 applied ($kN \cdot m^{-2}$)
3 m double span	4.1	9.0
4 m single span	2.1	8.0

(1) These figures are the result of short-term loading tests. 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) Load limit assuming a serviceability deflection limit of span/333.

(3) Factor of safety.

6.4 The design engineer must take account of sliding, overturning and panel racking. The methods given in BS 5268-6.1 : 1996 or BS EN 1995-1-1 : 2004 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), are used, a basic racking resistance[1][2] of 5.40 $kN \cdot m^{-1}$ for wall panel thickness can be assumed. The number and size of openings within the installed panels, together with the type and method of fixing to the sole plate and in turn, the sole plate to the foundation, will affect this figure. The design engineer should take these items into account when producing stability calculations.

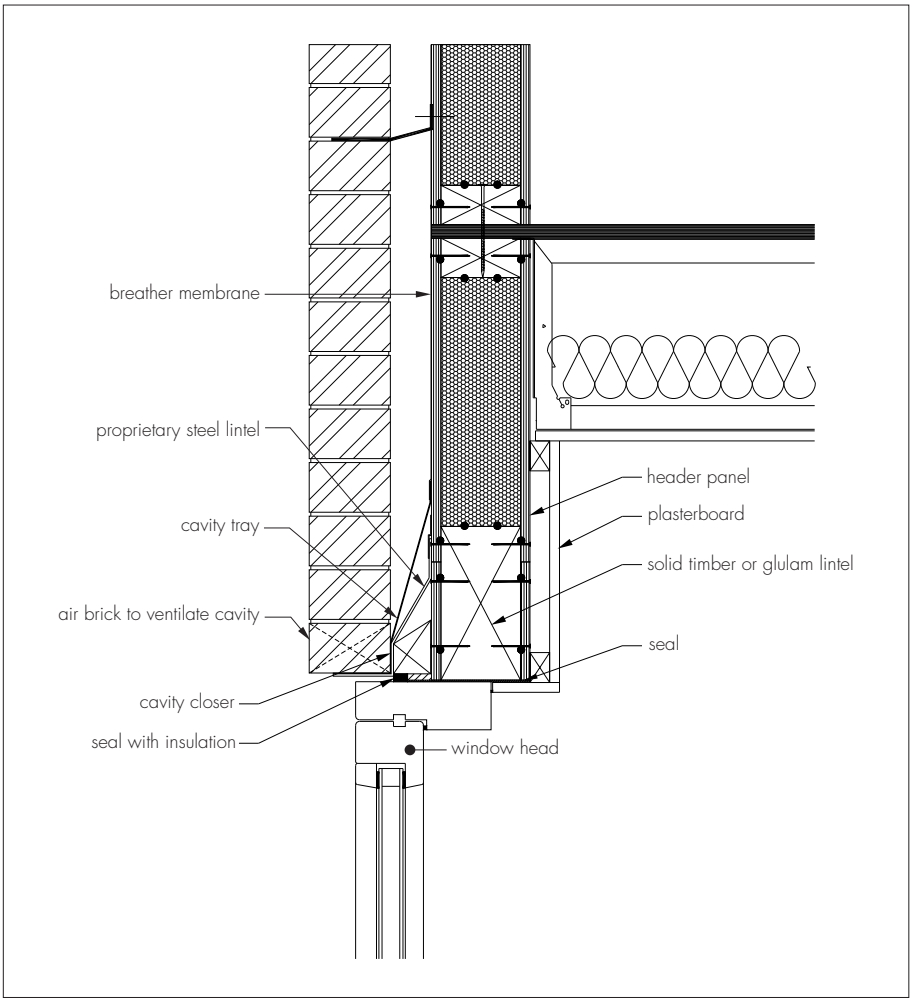
(1) The basic racking resistance value assumes that the sole plate is glued to the foam infill and the OSB skins are nailed to the sole plate using 50 mm long by 3.3 mm wire nails at 100 mm centres. Anchor bolts for fixing the sole plate to the test rig for the racking resistance tests were 12 mm diameter 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 racking resistance values may be modified by factors K_{104} to K_{108} in accordance with BS 5268-6.1 : 1996, to obtain design values.

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 engineer 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 2). The sizing of lintels must be determined by the engineer responsible for the design.

Figure 2 Typical lintel detail



6.7 As part of the structural design, consideration should be given to the support of eccentric loads imparted by central heating systems or kitchen appliances.

6.8 Stainless steel wall ties, 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.

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 λ_D values ($W \cdot m^{-1} \cdot K^{-1}$) may be used to conduct a 'combined method' calculation:

- polyurethane insulation core (thickness in mm):

75 to >80	0.030
≤80 to >120	0.029
≤120	0.028

- OSB/3 0.13.

7.3 The overall U value will depend on the construction adopted, the Certificate holder can provide further details on request.

8 Air permeability

8.1 SIP 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 [section 5 (43)] and, Technical Booklet F1 (sections 2.59 to 2.69) 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 (see relevant figures), 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 : 2011, vapour diffusion factors (μ) of 60 may be used for the external and internal OSB/3 skins.

9.3 The risk of interstitial condensation in both the external walling and the roofing is greatest when the building is drying out after construction. Guidance on preventing condensation is given in BRE Digest 369 and BR 262 : 2002.

10 Behaviour in relation to fire

10.1 When tested to BS 476-21 : 1987, the panel system achieved the results shown in Table 3.

Table 3 Fire performance

Performance	Axial load ($kN \cdot m^{-1}$)	Construction
FR30	8.33	12.5 mm fire-resistant plasterboard fixed directly to OSB or via 38 mm by 25 mm battens
FR60	13	One layer of 19 mm fire-resistant plasterboard, plus one layer of 12.5 mm plasterboard fixed directly to OSB

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 3), 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]
- separating walls 60 minutes (from either side)[2].

(1) 'Short' duration in Scotland.

(2) 'Medium' duration in Scotland.

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

(1) 'High risk' in Scotland.

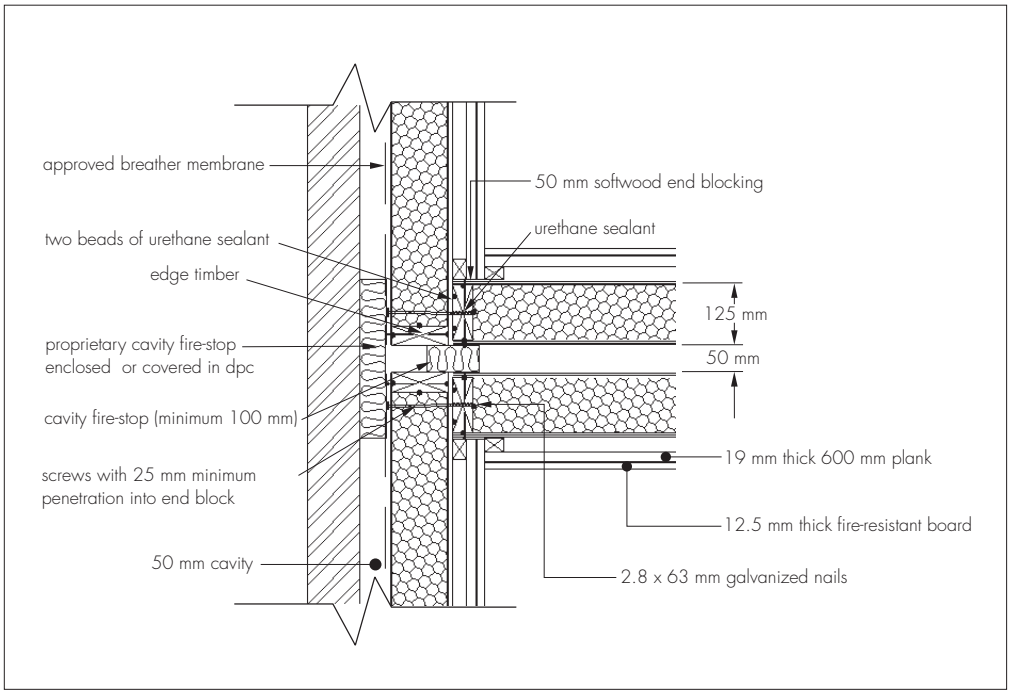
10.4 Junctions between the panels in external and separating walls will adequately maintain the fire resistance of the separating wall.

10.5 The panels can form part of a separating wall 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).

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 (see Figure 3). The maximum distance between cavity barriers, both vertically and horizontally must be accordance with the Mandatory Standard 2.4.

Figure 3 Typical separating wall detail (fire stopping)



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 Alternative build ups of plasterboard can achieve higher fire performance levels but have not been assessed by the BBA. Technical advice should be sought from plasterboard manufacturers.

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

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 Test data to BS EN ISO 140-3 : 1995 indicates that the separating wall construction detailed in Figure 3 can provide satisfactory resistance to airborne sound transmission, when used in conjunction with suitable flanking elements (see Table 4).

Table 4 Airborne sound insulation (dB) — Laboratory test results

Construction	Decibel rating (dB)
Separating wall (Figure 3)	R_w (C_I;C_{Ir}) = 60 (–2;–8) therefore: $R_w - C_{Ir}$ = 52
Internal wall[1]	R_w = 42

(1) Internal wall comprising a single 100 mm thick panel lined each side with 12.5 mm thick sound-resistant plasterboard.

12.2 Test data to BS EN ISO 140-3 : 1995 indicate that, in England and Wales, and Scotland, the single-leaf internal wall acoustic (non-loadbearing) construction can provide satisfactory resistance to airborne sound transmission within a dwelling for walls between a WC or bathroom and another room (see Table 4).

12.3 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.

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 5628-3 : 2005 or BS EN 1996-1-2 : 2005 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 and 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.

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, a life of at least 60 years may be expected.

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

Installation

16 General

16.1 Erection of the SIP Loadbearing Wall and Roof Panels must comply with the details 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:

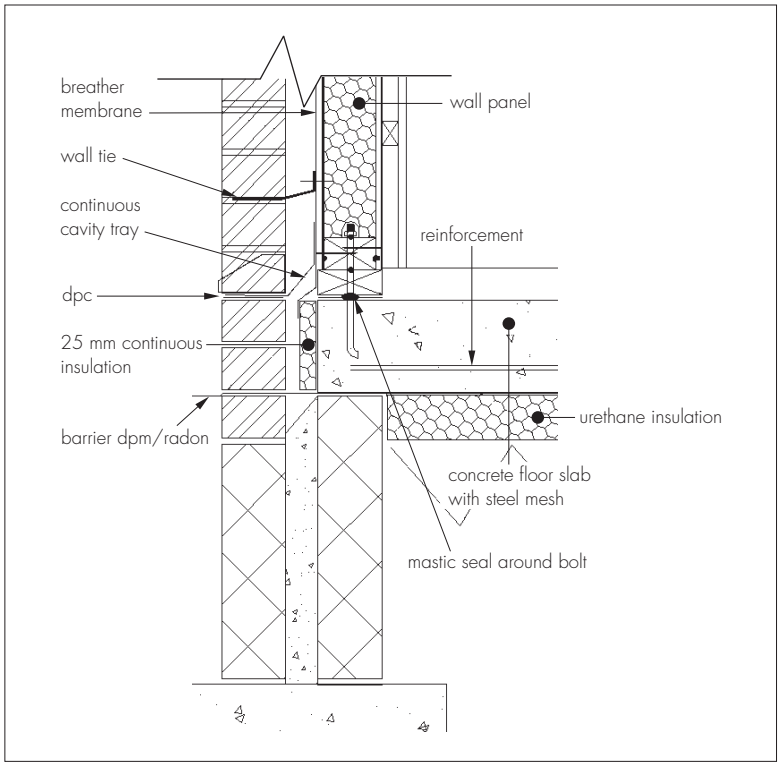
- level of the foundation or other bearing support
- overall width and length of the building footprint
- diagonals used for checking the overall squareness of the building.

17 Procedure

Foundation construction

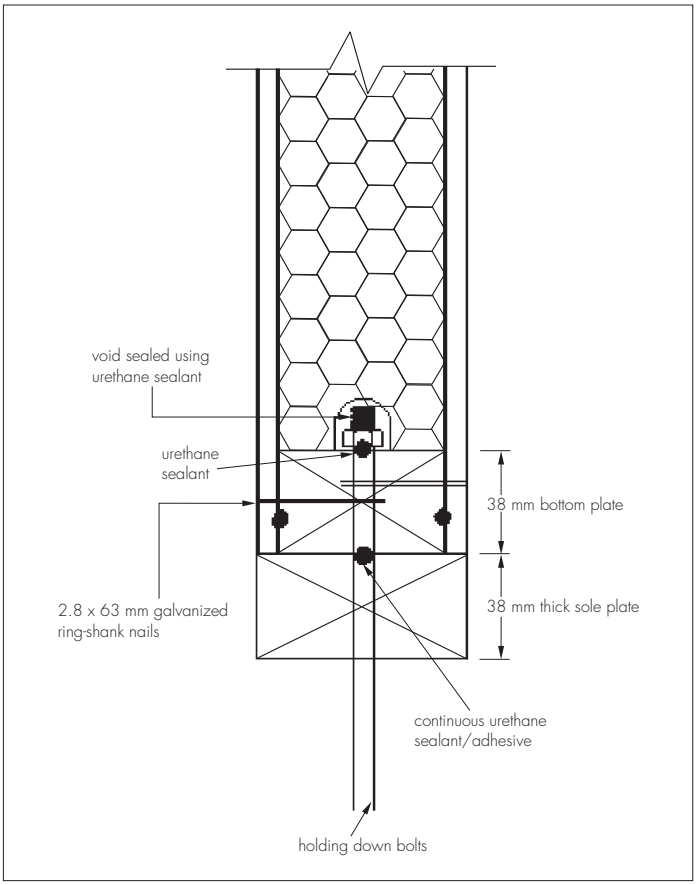
17.1 A suitable damp-proof course (dpc) is laid on top of the foundation (see Figure 4).

Figure 4 Typical ground-floor construction



17.2 A minimum 38 mm deep, treated timber sole plate (see Figure 4) is positioned over the dpc and fixed to the foundation using fixings as approved by the Certificate holder's and the Chartered Engineer's requirements. Typically, a holding down bolt arrangement (see Figure 5) should be used for securing into a concrete raft foundation, strapping where required onto masonry. Sole plates can be adjusted using galvanized or stainless steel shims and proprietary injectable mortar grouting is introduced to seal against air infiltration, if required.

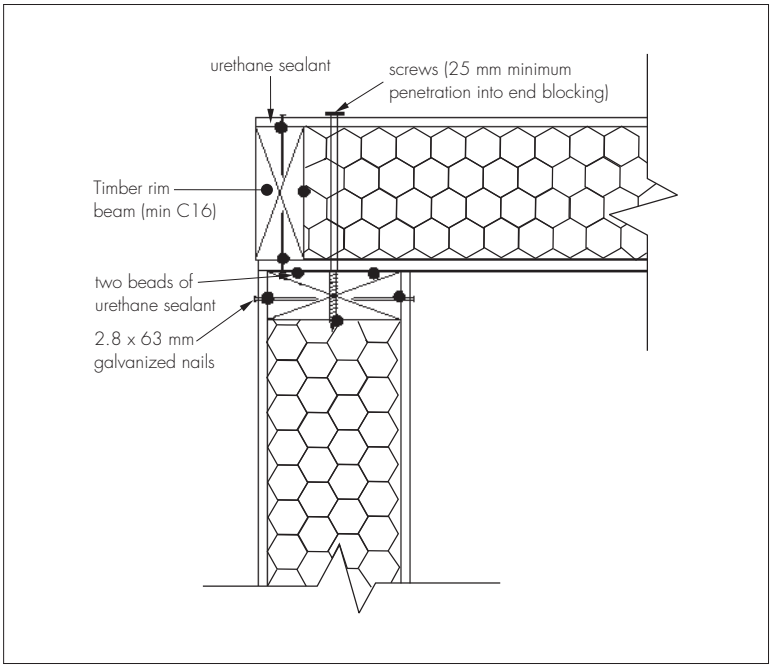
Figure 5 Typical sole plate detail



Ground-floor construction

17.3 A bead of urethane sealant is run along the top of the sole plate and a 50 mm deep, treated timber 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. Starting at one corner (see Figure 6), the first panel is positioned correctly on the bottom plate (see Figure 5), plumbed vertical and fixed 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 together using a spline joint connection (see Figure 1). 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.

Figure 6 Typical corner joint detail

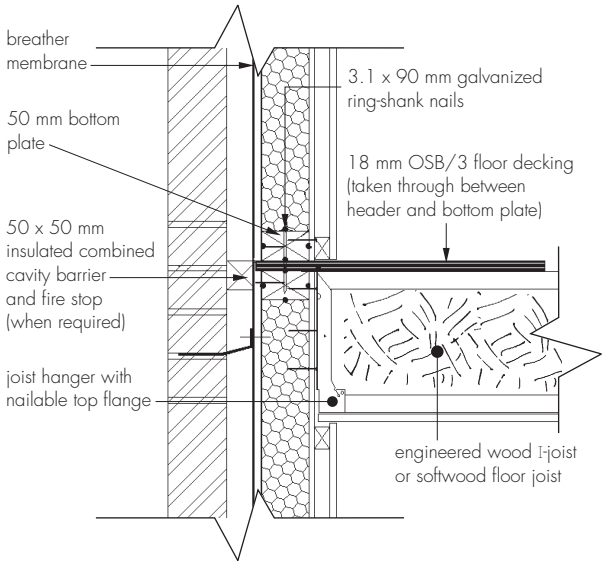


First floor and room-in-roof construction

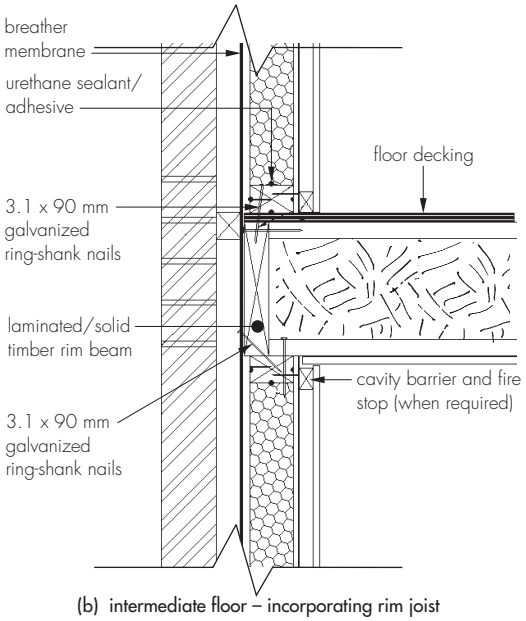
17.4 Engineered or traditional timber floor joists are supported either from the head of the wall panel or side of the panel using joist hangers and fixed by nailing into the head plate using galvanized ring-shank nails or screws approved by the Certificate holder (see Figure 7). Where the floor construction is supported by the wall panel head, a timber rim beam is introduced to partly support the upper wall panel (see Figure 7b).

17.5 A timber bottom plate (see Figure 7) is nailed through the floor decking into the head plate or rim beam. The procedure used for the ground-floor construction is followed.

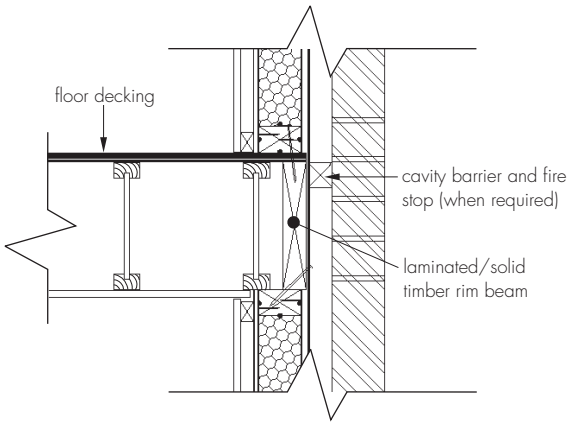
Figure 7 Typical first-floor construction



(a) intermediate floor – joist incorporating hanger



(b) intermediate floor – incorporating rim joist



(c) intermediate floor – side view

Roof construction

17.6 The external and internal first floor walls are stiffened through the use of intermediate/ridge beams/purlins as per design requirements (see Figure 8). 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 Sparrenagels or 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, minimum 25 mm deep by 50 mm wide, are then fixed through to the roof panel using stainless-steel 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 (see Figures 8 and 9).

Figure 8 Typical roof detail at ridge

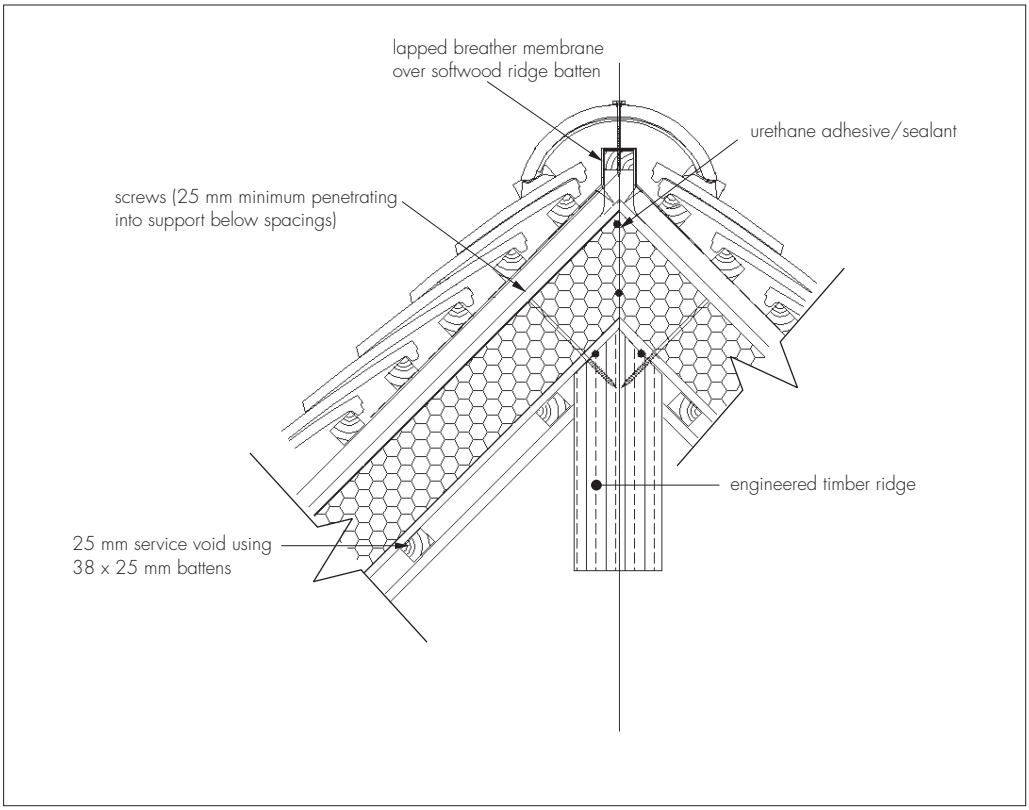
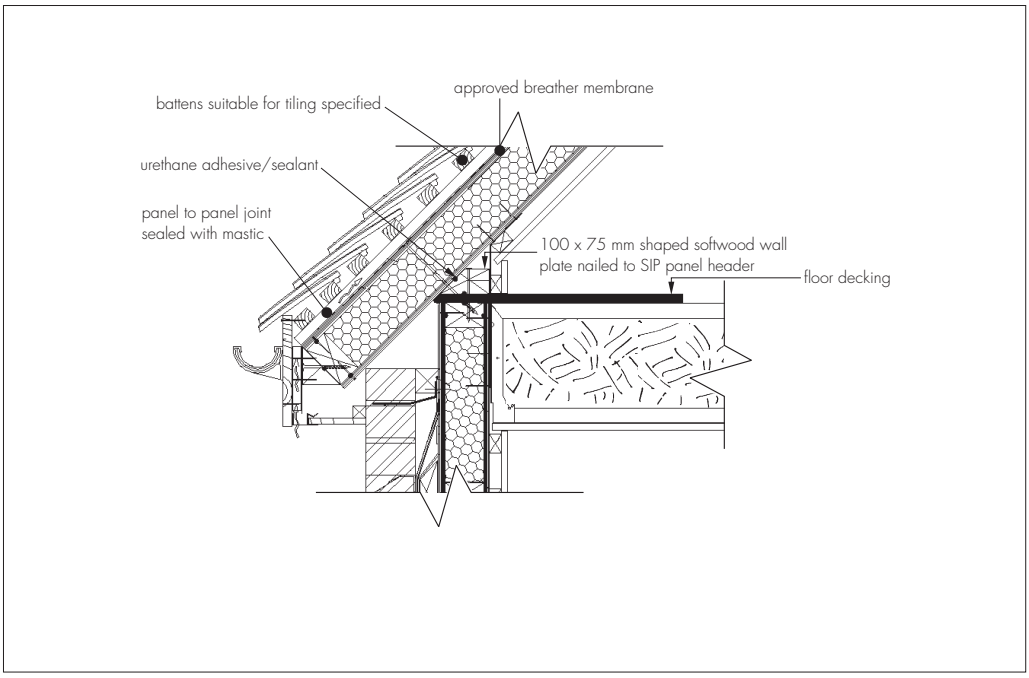


Figure 9 Typical eaves detail



Technical Investigations

18 Tests

Tests were carried out to determine:

- racking resistance in accordance with BS 5268-6.1 : 1996 and BS EN 594 : 1996
- vertical loading
- pull-out strength of wall ties based on BS DD 140-2 : 1987 and BS EN 846-6 : 2000
- fire-resistance to BS 476-21 : 1987.

19 Investigations

19.1 An examination was made of technical data relating to:

- structural properties and design calculations
- airborne sound insulation tests
- air leakage tests.

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 476-21 : 1987 *Fire tests on building materials and structures — Methods for determination of the fire resistance of loadbearing elements of construction*

BS 5250 : 2011 *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 DD 140-2 : 1987 *Wall ties — Recommendations for design of wall ties*

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 846-6 : 2000 *Methods of test for ancillary components for masonry — Determination of tensile and compressive load capacity and load displacement characteristics of wall ties (single end test)*

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 1996-2 : 2006 Eurocode 6 *— Design of masonry structures — Design considerations, selection of materials and execution of masonry*

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

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

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

BRE Digest 369 *Interstitial condensation and fabric degradation*

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
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- 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:

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