Sips Eco Panel Systems Ltd
4-7 Boston Road
Viewfield Industrial Estate
Glenrothes
Fife KY6 2RE

Tel: 01592 631636
e-mail: admin@sipseco.co.uk
website: www.sipsecopanels.co.uk

Agrément Certificate
22/6249
Product Sheet 1

SIPS ECO STRUCTURAL INSULATED PANEL SYSTEM

SIPS ECO PANELS

This Agrément Certificate Product Sheet(1) relates to SIPS Eco Panels, comprising structurally insulated panels (SIPs) manufactured from oriented strand board type 3 (OSB/3), with an expanded polystyrene (EPS) insulation core, for use above the damp proof course (dpc) in domestic and non-domestic applications (subject to national height restrictions) as: the loadbearing inner leaf of external cavity walls; part of separating walls; internal loadbearing walls; flat and pitched roofs (including room-in-roof); or as non-loadbearing infill panels.

(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 panels have adequate strength and stiffness to resist the loads associated with installation and in-service loading (see section 6).

Thermal performance — the panels contribute to the overall performance of the wall and roof construction (see section 7).

Condensation — walls and roofs can adequately limit the risk of surface and interstitial condensation (see section 8).

Behaviour in relation to fire — the Certificate holder has not declared a reaction to fire classification for the complete system in accordance with BS EN 13501-1 : 2018. With adequate protection, constructions including the panels, can satisfy resistance to fire classification periods of RE120 to BS EN 13501-2 : 2016 (see section 9).

Resistance to airborne sound — test data indicate that separating walls used in conjunction with suitable linings and flanking elements can provide sufficient resistance to airborne sound (see section 12).

Durability — provided the installation remains weathertight and the panels are protected from damage by the external and internal finishes, the panels will have a service life of at least 60 years (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.

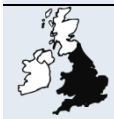
On behalf of the British Board of Agrément

Date of First issue: 8 August 2022

Hardy Giesler
Chief Executive Officer

Regulations

In the opinion of the BBA, SIPS Eco Panels, if installed, used and maintained in accordance with this Certificate, can satisfy or contribute to satisfying the relevant requirements of the following Building Regulations (the presence of a UK map indicates that the subject is related to the Building Regulations in the region or regions of the UK depicted):



The Building Regulations 2010 (England and Wales) (as amended)

Requirement:	**A1**	**Loading**
Comment:		Walls and roofs constructed from the panels will have sufficient strength and stiffness when designed and constructed in accordance with sections 6.2 to 6.4 of this Certificate.
Requirement:	**A3**	**Disproportionate collapse**
Comment:		Wall panels can contribute to a construction satisfying this Requirement. See sections 6.2 to 6.4 of this Certificate.
Requirement:	**B3(1)(2)**	**Internal fire spread (structure)**
Comment:	**(3)(a)**	Wall panels with an appropriate lining can contribute to satisfying this Requirement. See section 9.5 of this Certificate.
Requirement:	**B3(4)**	**Internal fire spread (structure)**
Comment:		The panels are restricted by this Requirement. See sections 9.1 and 9.2 of this Certificate.
Requirement:	**B4(1)**	**External fire spread (structure)**
Comment:		The panels are restricted by this Requirement. See sections 9.1 and 9.3 of this Certificate.
Requirement:	**C2(c)**	**Resistance to moisture**
Comment:		The wall and roof panels can adequately limit the risk of surface condensation and contribute to minimising the risk of interstitial condensation. See sections 8.1 to 8.3 of this Certificate.
Requirement:	**E1**	**Protection against sound from other parts of the building and adjoining buildings**
Comment:		When installed with suitable linings and flanking elements, separating walls incorporating the panels can satisfy this Requirement. See section 12.3 of this Certificate.
Requirement:	**L1(a)(i)**	**Conservation of fuel and power**
Comment:		The panels can contribute to satisfying this Requirement although compensating measures may be required in some cases. See sections 7.1 to 7.3 and 10.1 of this Certificate.
Regulation:	**7(1)**	**Materials and workmanship**
Comment:		The panels are acceptable. See section 15.1 and the *Installation* part of this Certificate.
Regulation:	**7(2)**	**Materials and workmanship**
Comment:		The panels are restricted by this Regulation. See section 9.1 of this Certificate.
Regulation:	**26**	**CO_2 emission rates for new buildings**
Regulation:	**26A**	**Fabric energy efficiency rates for new buildings (applicable to England only)**
Regulation:	**26A**	**Primary energy consumption rates for new buildings (applicable to Wales only)**
Regulation:	**26B**	**Materials and workmanship (applicable to England only)**
Regulation:	**26C**	**Target primary energy rates for new buildings (applicable to England only)**
Comment:		The panels can contribute to satisfying these Regulations although compensating fabric and/or services measures may be required in some cases. See sections 7.1 to 7.3 and 10.1 of this Certificate.

The Building (Scotland) Regulations 2004 (as amended)

Regulation:	**8(1)(2)**	**Durability, workmanship and fitness of materials**
Comment:		The panels can contribute to a construction satisfying this Regulation. See section 15.1 and the *Installation* part of this Certificate.
Regulation:	**8(3)**	**Durability, workmanship and fitness of materials**
Comment:		The panels are restricted by this Regulation. See sections 9.1 and 9.4 of this Certificate.
Regulation:	**9**	**Building standards applicable to construction**
Standard:	1.1(a)	Structure
Comment:		Walls and roofs incorporating the panels will have sufficient strength and stiffness when designed and constructed in accordance with sections 6.2 to 6.4 of this Certificate, with reference to clauses 1.1.1(1)(2) and 1.1.2(1)(2) of this Standard.
Standard:	1.2	Disproportionate collapse
Comment:		Wall panels can contribute to a construction satisfying the requirements of this Standard, with reference to clause 1.2.1(1)(2). See sections 6.2 to 6.4 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 'long' duration, with reference to clauses 2.2.1(1)(2), 2.2.2(1)(2), 2.2.3(1)(2), 2.2.4(1)(2), 2.2.5(1)(2) and 2.2.6(1)(2) of these Standards. See sections 9.1 and 9.5 of this Certificate.
Standard:	2.3	Structural protection
Comment:		Walls using the appropriate lining can achieve a period of fire resistance of 'long' duration, with reference to clauses 2.3.1(1)(2) to 2.3.3(1)(2) and 2.3.5(1)(2) of this Standard. See sections 9.1 and 9.5 of this Certificate.
Standard:	2.4	Cavities
Comment:		The panels are restricted by this Standard, with reference to clause 2.4.2(1)(2). See sections 9.1 and 9.2 of this Certificate.
Standard:	2.6	Spread to neighbouring buildings
Comment:		Walls using the appropriate lining can achieve a period of fire resistance of 'long' duration and are restricted in some cases, with reference to clauses 2.6.1(1)(2) and 2.6.5(1)(2) of this Standard. See sections 9.1, 9.4 and 9.5 of this Certificate.
Standard:	2.7	Spread on external walls
Comment:		The panels are restricted by this Standard, with reference to clause 2.7.1(1)(2) of this Standard. See sections 9.1 and 9.4 of this Certificate.
Standard:	3.15	Condensation
Comment:		The panels can adequately limit the risk of surface condensation and contribute to limiting the risk of interstitial condensation, with reference to clauses 3.15.1(1)(2) and 3.15.3(1)(2) to 3.15.7(1)(2) of this Standard. See sections 8.1 to 8.3 of this Certificate.
Standard:	5.1	Noise separation
Comment:		Separating walls with suitable linings and flaking elements can satisfy this Standard, with reference to clauses 5.1.1(1)(2) and 5.1.2(1)(2) of this Standard. See section 12.3 of this Certificate.
Standard:	6.1(b)	Carbon dioxide emissions
Comment:		The panels can contribute to satisfying this Standard, with reference to clauses 6.1.1(1), 6.1.2(2) and 6.1.6(1). Compensating fabric and/or services, measures may be required in some cases. See sections 7.1 to 7.3 and 10.1 of this Certificate.

Standard:	6.2	Building insulation envelope
Comment:		The panels can contribute to satisfying this Standard, with reference to clauses 6.2.1(1)(2), 6.2.3(1)(2), 6.2.4(1), 6.2.5(2)and 6.2.6(2), although compensating fabric measures may be required. See sections 7 and 10.1 of this Certificate.
Standard:	7.1(a)(b)	Statement of sustainability
Comment:		The system can contribute to satisfying the relevant requirements of Regulation 9, Standards 1 to 6, and therefore will contribute to a construction meeting a bronze level of sustainability as defined in this Standard. See section 7 of this Certificate.
Regulation:	**12**	**Building standards applicable to conversions**
Comment:		All comments given for the products under Regulation 9, Standards 1 to 6, also apply to this Regulation, with reference to clauses 0.12.1(1)(2) and clause 0.12.2(1)(2).

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

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

Regulation:	**23(a)(i)**	**Fitness of materials and workmanship**
Comment:	**(iii)(b)(i)**	The panels are acceptable. See section 15.1 and the *Installation* part of this Certificate.
Regulation:	**29**	**Condensation**
Comment:		The panels can contribute to minimising the risk of interstitial condensation. See sections 8.2 and 8.3 of this Certificate.
Regulation:	**30**	**Stability**
Comment:		Walls and roofs constructed from the panels will have sufficient strength and stiffness to satisfy this Regulation, when designed and constructed in accordance with sections 6.2 to 6.4 of this Certificate.
Regulation:	**31**	**Disproportionate collapse**
Comment:		Wall panels can contribute to a construction satisfying this Regulation. See sections 6.2 to 6.4 of this Certificate.
Regulation:	**35(1)(2)**	**Internal fire spread - structure**
Comment:	**(3)**	The wall panels, with appropriate lining, can contribute to satisfying this Regulation. See section 9.5 of this Certificate.
Regulation:	**35(4)**	**Internal fire spread - structure**
Comment:		The panels are restricted by this Regulation. See sections 9.1 and 9.2 of this Certificate.
Regulation:	**36(a)**	**External fire spread**
Comment:		The panels are restricted by this Regulation. See sections 9.1 and 9.3 of this Certificate.
Regulation:	**39(a)(i)**	**Conservation measures**
Comment:		The panels can contribute to satisfying this Regulation. See sections 7 and 10.1 of this Certificate.
Regulation:	**40(2)**	**Target carbon dioxide emission rate**
Regulation:	**43(B)**	**Nearly zero-energy requirements for new buildings**
Comment:		The panels can contribute to satisfying these Regulations. See sections 7.1 to 7.3 and 10.1 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 satisfy this Regulation. See section 12.3 of this Certificate.

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

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

See sections: *1 Description* (1.1) and 3 *Delivery and site handling* (3.1) of this Certificate.

Additional Information

NHBC Standards 2022

In the opinion of the BBA, SIPs Eco Panels, if installed, used and maintained in accordance with this Certificate, can satisfy or contribute to satisfying the relevant requirements in relation to *NHBC Standards*, Part 6 *Superstructure (excluding roofs),* Chapter 6.2 *External timber framed walls*, and Part 7 *Roofs,* Chapters 7.1 *Flat roofs and balconies* and 7.2 *Pitched roofs*.

Technical Specification

1 Description

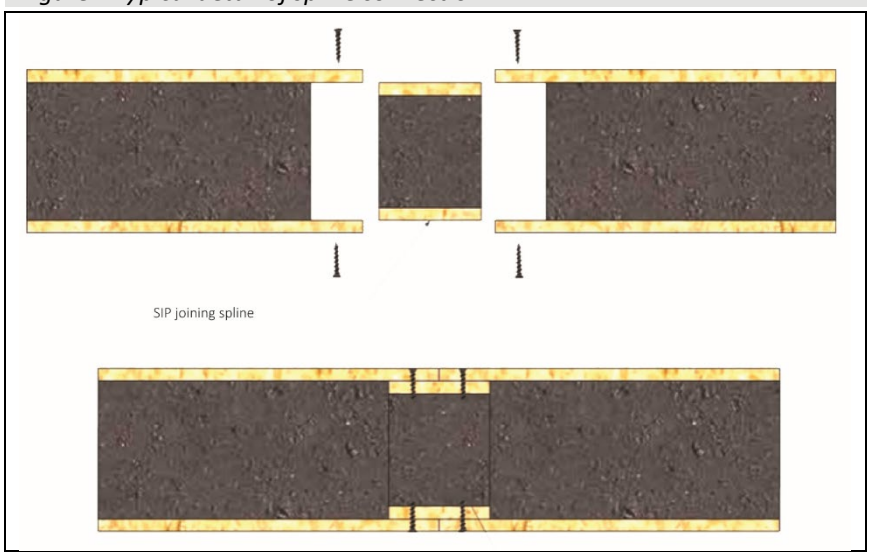
1.1 Sips Eco Panels are structurally insulated panels consisting of two outer-skins of oriented strand board, type 3 (OSB/3), with an expanded polystyrene (EPS) insulating core. The panels have the nominal characteristics given in Table 1.

Table 1 Sips Eco Panel nominal characteristics

Characteristic (unit)	Specification
Overall thickness (mm)	119, 144, 169, 194, 219
OSB skin thickness (mm)	11
EPS insulation core thickness (mm)	97, 122, 147, 172, 197
Insulation density (kg·m^{-3})	18 to 20
Weight (kg·m^{-2})	15.3 to 19.4
Standard panel dimensions (mm)	1197 x 2397, 1197 x 2697, 1197 x 5097
Edge	Rebated

1.2 The panels are connected using insulated splines, 90 mm wide with a thickness to match the panels' EPS core thickness, or, when required, solid timber splines. The splines are located in the preformed rebates within the long edges of the panels (see Figure 1) and fixed using screws (see Figure 2) or nail fixings.

Figure 1 Typical detail of spline connection

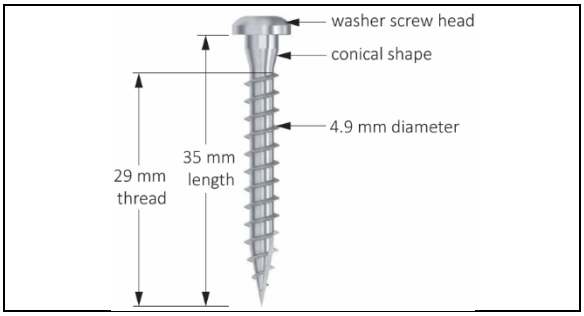


1.3 The Certificate holder recommends the following ancillary items for use with the panels, but these materials have not been assessed by the BBA and are outside the scope of this Certificate:

- top/bottom locking rails — 4.8 m long, treated solid timber studs (C16 grade or above), 45 mm thick and width to match the EPS core thickness
- sole plates — 47 mm thick treated timber(1)
- stud end closures — 45 mm, treated timber (C16 grade or above) depending on panel thickness
- rim board — 45 mm engineered timber rim board, if required, for joist bracing
- wood-screws — self-drilling, powder-coated 10 gauge; 250 mm long for roof panels, 150 mm long for wall panel to wall panel junctions, 35 mm for panel to bottom/top rail
- wood-screws — galvanized 45 mm by 10 gauge for fixing top plate to top rail
- spline fixing screws — same specifications as wood screws as detailed in Figure 2
- nails — galvanized 65 by 3.65 mm for fixing bottom rail to sole plate joist hangers or truss clips — with top plate support as specified for the project. All fixings to be in accordance with the joist hanger based on project requirements
- galvanized straps — for fixing wall sections to foundations
- steel members, engineered timber beams and posts — items used where extra rigidity, or a separate structural frame is required
- breather membrane — fixed to the cavity side of the panel in external wall
- LR roof tile underlay — for roof panel constructions
- counter battens — treated softwood (C16 grade or above) counter battens, minimum 38 by 50 mm, to give additional support to decking where required
- sealant — expanding urethane foam
- damp-proof course (dpc) — installed in accordance with BS EN 1996-2 : 2006, PD 6697 : 2019, BS 8000-3 : 2001 and BS 8215 : 1991, with a minimum 1.2 mm thickness and 1.5 $kg \cdot m^{-2}$ weight
- wall ties — helical fasteners, stainless steel Helifix TimTie 6 or Simpson Strong-Tie SWT-50 TEK wall-tie to BS EN 845-1 : 2013, using flange-head 30 by 4 mm stainless steel screws.

(1) Sole plate size is increased pro rata for thicker panels.

Figure 2 Typical Sips Eco Panel fixing screw



2 Manufacture

2.1 SIPS Eco Panels are composite building panels manufactured from an EPS insulating foam core, adhesively bonded between two structural skins of OSB/3 board. The panels are checked for squareness and are pressed and cured to SIP Eco Panel Systems Ltd's agreed specification and standards. Each panel is then cut to the correct dimension and passed down the line to the rebate station for straightness and angle checking. Quality checks are carried out during the manufacturing process and on the finished panels. All panels are double checked at the rebate station for panel sizing before being wrapped ready for delivery.

2.2 As part of the assessment and ongoing surveillance of product quality, the BBA has:

- agreed with the manufacturer the quality control procedures and product testing to be undertaken
- assessed and agreed the quality control operated over batches of incoming materials
- monitored the production process and verified that it is in accordance with the documented process
- evaluated the process for management of nonconformities
- checked that equipment has been properly tested and calibrated

- undertaken to carry out the above measures on a regular basis through a surveillance process, to verify that the specifications and quality control operated by the manufacturer are being maintained.

2.3 The management system of SIPS Eco Panels has been assessed and registered as meeting the requirements of BS EN ISO 9001: 2015 by CATG Registration Number CATG-ISO-939.

3 Delivery and site handling

3.1 The panels are delivered to site on a flatbed lorry and can be craned straight into position.

3.2 The panels can be stored flat on a level stillage. Each panel should be supported by bearers at 600 mm (maximum) centres, and bearers should be aligned vertically. The panels and all components should be kept under cover in dry, sheltered conditions, at least 150 mm off the ground.

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

3.4 Each panel bears the BBA logo incorporating the number of this Certificate.

Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on Sips Eco Panels.

Design Considerations

4 General

4.1 Sips Eco Panels are suitable for use as above the dpc as loadbearing partitions, separating walls, the inner leaf of external cavity walls, and pitched and flat roofs in domestic and non-domestic applications at roof level (except where national height restrictions apply). Wall panels are generally formed in whole or part wall lengths, including openings, subject to design, manufacture, lifting, hoisting and transport restrictions. The panels may also be used as infill panels in multi-storey framed buildings subject to design constraints on height and the method of fixing to the structural frame. All fixings must be designed to allow movement within the structural frame due to expansion/contraction or differential movement.

4.2 When panels are used to construct the inner leaf of an external cavity wall, the outer masonry leaf and all masonry below the dpc must be designed and constructed in accordance with BS EN 1996-1-1 : 2005, BS EN 1996-1-2 : 2005 and BS EN 1996-2 : 2006 and their UK National Annexes, and PD 6697 : 2010. When the panels are used in a roof, the roof tiles and slates must be applied in accordance with BS 5534 : 2014.

4.3 All structural calculations for the design of wall and roof panels must be undertaken by a qualified structural engineer, who must contact the Certificate holder for application guidance for the panels. All production drawings should be produced by the Certificate holder, in accordance with the standard details and design manuals for the products (the latest version of which can be requested from the Certificate holder).

4.4 Any cutting or forming of openings for windows and doors within wall or roof panels must be agreed by the structural engineer, in order not to affect the loadbearing capacity of individual elements and the overall stability of the structure.

4.5 Foundations and floors (outside the scope of this Certificate) must be approved for use by the Certificate holder's qualified engineer and should be suitably level and square to accept the products.

5 Practicability of installation

The panels should only be installed by operatives who have been trained by the Certificate holder.

6 Strength and stability

General

6.1 The wall and roof panels will have adequate strength and stiffness to sustain the applied loading when used in accordance with the provisions of this Certificate. When using the panels, building designers must take into account shear deformation and the long-term creep effects of permanent loading and cracking to internal finishes. Due consideration must also be given to any fire-resistance requirements (see section 9 of this Certificate).

6.2 The limit state design values to be used when evaluating the design resistances of the panels in compliance with Eurocodes are given in Tables 2 to 6 of this Certificate. The products differ to standard timber-frames, but are usually erected by timber-frame erectors. For wall application, the OSB facing panels must be fully supported. The structural capacity data is based on test results and the design principles set out in BS EN 1995-1-1 : 2004 and its UK National Annex, and is intended to provide the designer with sufficient information to undertake the structural design of these elements.

Table 2 Structural properties – limit state design(1) – 119 mm thick Sips Eco Panel

Strength		Duration of load				
	Unit	Permanent	Long	Medium	Short	Instantaneous
Bending strength(2) (M_{Rd})	$kN{\cdot}m{\cdot}m^{-1}$	1.96	4.11	6.51	8.38	10.24
Shear strength(2) (V_{Rd})	$kN{\cdot}m^{-1}$	1.62	2.70	4.05	5.40	5.40
Bearing strength(3) (B_R) min 90 mm	$kN{\cdot}m^{-1}$	2.92	4.87	7.30	9.73	9.73
Axial strength(4)(8) (N)						
Wall height <2400 mm	$kN{\cdot}m^{-1}$	9.70	19.52	32.78	56.54	69.11
Wall height 2400 to 2700 mm	$kN{\cdot}m^{-1}$	8.92	18.35	30.64	56.54	69.11
Wall height 2700 to 3000 mm	$kN{\cdot}m^{-1}$	8.19	17.19	28.57	56.54	69.11
Wall height 3000 to 3500 mm	$kN{\cdot}m^{-1}$	7.08	15.35	25.30	55.45	69.11
Wall height 3500 to 4000 mm	$kN{\cdot}m^{-1}$	6.12	13.67	22.36	46.90	60.30
Wall height 4000 to 4800 mm	$kN{\cdot}m^{-1}$	4.89	11.34	18.35	36.36	46.75
Stiffness(5)(6)(7)						
EI_{inst}	$N{\cdot}mm^2$	243.78 E+9				
EI_{perm}	$N{\cdot}mm^2$	$EI_{inst}/(1+1.87)$				
GA_{inst}	N	326.26 E+3				
GA_{perm}	N	$GA_{inst}/(1+3.47)$				

(1) The strength values in this Table are design values that should be compared to the worst loading case at the Ultimate Limit State (ULS). The tabulated strength properties were compared with laboratory test results to verify the calculated values.

(2) When checking a panel under combined loading (axial + bending), use the interaction formula: $N_{Ed} / N_{Rd} + M_{Ed} / M_{Rd} \leq 1.0$ (where N_{Ed} and M_{Ed} are calculated on specific project basis, and N_{Rd} and M_{Rd} are taken from the values in the above Table).

(3) The bearing strength (B_R) is intended for the verification of panels installed continuously over intermediate support. The bearing strength at the end support should be resisted by including an edge timber in the panel at the support and should be 45 mm minimum.

(4) Axial load is assumed to be applied concentrically or at a maximum eccentricity of width/6 towards the OSB face in service class 1.

(5) The stiffness values and deflection factors must be used to calculate the instantaneous and final deflection according to BS EN 1995-1-1 : 2004.

(6) The out-of-plane deflection of the panel must be verified and limited to L/350 for instantaneous deflection and L/300 for long-term deflection.

(7) The deflection due to shear must be taken into account and every appropriate deflection limit should be defined for each project on a case-by-case basis.

(8) Structural insulated panels transfer any in-plane forces through the OSB/3 outer skin. The facing OSB/3 skin is to be fully supported on both faces of the panel, typically bearing directly on the top and bottom sill.

Table 3 Structural properties – limit state design[1] – 144 mm thick Sips Eco Panel

Strength	Duration of Load					
	Unit	Permanent	Long	Medium	Short	Instantaneous
Bending strength[2] (M_{Rd})	$kN{\cdot}m{\cdot}m^{-1}$	2.41	5.06	8.02	10.31	12.61
Shear strength[2] (V_{Rd})	$kN{\cdot}m^{-1}$	2.00	3.33	4.99	6.65	6.65
Bearing strength[3] (B_R) min 90 mm	$kN{\cdot}m^{-1}$	3.05	5.09	7.63	10.18	10.18
Axial Strength[4][8] (N)						
Wall height <2400 mm	$kN{\cdot}m^{-1}$	12.49	24.63	41.49	56.54	69.11
Wall height 2400 to 2700 mm	$kN{\cdot}m^{-1}$	11.63	23.38	39.21	56.54	69.11
Wall height 2700 to 3000 mm	$kN{\cdot}m^{-1}$	10.80	22.13	36.94	56.54	69.11
Wall height 3000 to 3500 mm	$kN{\cdot}m^{-1}$	9.50	20.08	33.29	56.54	69.11
Wall height 3500 to 4000 mm	$kN{\cdot}m^{-1}$	8.35	18.15	29.87	56.54	69.11
Wall height 4000 to 4800 mm	$kN{\cdot}m^{-1}$	6.80	15.38	25.05	51.28	65.93
Stiffness[5][6][7]						
EI_{inst}	$N{\cdot}mm^2$	369.7 E+9				
EI_{perm}	$N{\cdot}mm^2$	$EI_{inst}/(1+1.87)$				
GA_{inst}	N	393.89 E+3				
GA_{perm}	N	$GA_{inst}/(1+3.47)$				

(1) The strength values in this Table are design values that should be compared to the worst loading case at the ULS. The tabulated strength properties were compared with laboratory test result to verify the calculated values.

(2) When checking a panel under combined loading (axial + bending), use the interaction formula: NEd / NRd + MEd / MRd ≤ 1.0 (where NEd and MEd are calculated on specific project basis, and NRd and MRd are taken from the values in the above Table).

(3) The bearing strength (BR) is intended for the verification of panels installed continuously over intermediate support. The bearing strength at the end support should be resisted by including an edge timber in the panel at the support and should be 45 mm minimum.

(4) Axial load is assumed to be applied concentrically or at a maximum eccentricity of width/6 towards the OSB face in service class 1.

(5) The stiffness values and deflection factors must be used to calculate the instantaneous and final deflection according to BS EN 1995-1-1 : 2004.

(6) The out-of-plane deflection of the panel must be verified and limited to L/350 for instantaneous deflection and L/300 for long-term deflection.

(7) The deflection due to shear must be taken into account and every appropriate deflection limit should be defined for each project on a case-by-case basis.

(8) Structural insulated panels transfer any in-plane forces through the OSB/3 outer skin. The facing OSB/3 skin is to be fully supported on both faces of the panel, typically bearing directly on the top and bottom sill.

Table 4 Structural properties – limit state design[1] – 169 mm thick Sips Eco Panel

Strength	Unit	Duration of load				
		Permanent	Long	Medium	Short	Instantaneous
Bending strength[2] (M_{Rd})	$kN{\cdot}m{\cdot}m^{-1}$	2.86	6.01	9.53	12.25	14.96
Shear strength[2] (V_{Rd})	$kN{\cdot}m^{-1}$	2.37	3.95	5.93	7.90	7.90
Bearing strength[3] (B_R) min 90 mm	$kN{\cdot}m^{-1}$	3.19	5.31	7.97	10.63	10.63
Axial Strength[4][8] (N)						
Wall height <2400 mm	$kN{\cdot}m^{-1}$	15.30	29.68	46.89	56.54	69.11
Wall height 2400 to 2700 mm	$kN{\cdot}m^{-1}$	14.38	28.39	46.89	56.54	69.11
Wall height 2700 to 3000 mm	$kN{\cdot}m^{-1}$	13.47	27.07	45.33	56.54	69.11
Wall height 3000 to 3500 mm	$kN{\cdot}m^{-1}$	12.02	24.88	41.38	56.54	69.11
Wall height 3500 to 4000 mm	$kN{\cdot}m^{-1}$	10.69	22.75	37.60	56.54	69.11
Wall height 4000 to 4800 mm	$kN{\cdot}m^{-1}$	8.86	19.61	32.09	56.54	69.11
Stiffness[5][6][7]						
EI_{inst}	$N{\cdot}mm^2$	521.75 E+9				
EI_{perm}	$N{\cdot}mm^2$	$EI_{inst}/(1+1.87)$				
GA_{inst}	N	461.73 E+3				
GA_{perm}	N	$GA_{inst}/(1+3.47)$				

(1) The strength values in this Table are design values that should be compared to the worst loading case at the ULS. The tabulated strength properties were compared with laboratory test result to verify the calculated values.

(2) When checking a panel under combined loading (axial + bending), use the interaction formula: $N_{Ed} / N_{Rd} + M_{Ed} / M_{Rd} \leq 1.0$ (where N_{Ed} and M_{Ed} are calculated on specific project basis, and N_{Rd} and M_{Rd} are taken from the values in the above Table).

(3) The bearing strength (B_R) is intended for the verification of panels installed continuously over intermediate support. The bearing strength at the end support should be resisted by including an edge timber in the panel at the support and should be 45 mm minimum.

(4) Axial load is assumed to be applied concentrically or at a maximum eccentricity of width/6 towards the OSB face in service class 1.

(5) The stiffness values and deflection factors must be used to calculate the instantaneous and final deflection according to BS EN 1995-1-1 : 2004.

(6) The out-of-plane deflection of the panel must be verified and limited to L/350 for instantaneous deflection and L/300 for long-term deflection.

(7) The deflection due to shear must be taken into account and every appropriate deflection limit should be defined for each project on a case-by-case basis.

(8) Structural insulated panels transfer any in-plane forces through the OSB/3 outer skin. The facing OSB/3 skin is to be fully supported on both faces of the panel, typically bearing directly on the top and bottom sill.

Table 5 Structural properties – limit state design[1] – 194 mm thick Sips Eco Panel

Strength	Duration of load					
	Unit	Permanent	Long	Medium	Short	Instantaneous
Bending strength[2] (M_{Rd})	$kN{\cdot}m{\cdot}m^{-1}$	3.31	6.96	11.04	14.19	17.35
Shear strength[2] (V_{Rd})	$kN{\cdot}m^{-1}$	2.75	4.58	6.86	9.15	9.15
Bearing strength[3] (B_R) min 90 mm	$kN{\cdot}m^{-1}$	3.32	5.54	8.30	11.07	11.07
Axial Strength[4][8] (N)						
Wall height <2400 mm	$kN{\cdot}m^{-1}$	18.11	34.66	46.89	56.54	69.11
Wall height 2400 to 2700 mm	$kN{\cdot}m^{-1}$	17.14	33.34	46.89	56.54	69.11
Wall height 2700 to 3000 mm	$kN{\cdot}m^{-1}$	16.17	31.98	46.89	56.54	69.11
Wall height 3000 to 3500 mm	$kN{\cdot}m^{-1}$	14.59	29.68	46.89	56.54	69.11
Wall height 3500 to 4000 mm	$kN{\cdot}m^{-1}$	13.12	27.41	45.43	56.54	69.11
Wall height 4000 to 4800 mm	$kN{\cdot}m^{-1}$	11.03	23.96	39.35	56.54	69.11
Stiffness[5][6][7]						
EI_{inst}	$N{\cdot}mm^2$	699.92 E+9				
EI_{perm}	$N{\cdot}mm^2$	$EI_{inst}/(1+1.87)$				
GA_{inst}	N	529.69 E+3				
GA_{perm}	N	$GA_{inst}/(1+3.47)$				

(1) The strength values in this Table are design values that should be compared to the worst loading case at the ULS. The tabulated strength properties were compared with laboratory test result to verify the calculated values.

(2) When checking a panel under combined loading (axial + bending), use the interaction formula: $N_{Ed} / N_{Rd} + M_{Ed} / M_{Rd} \leq 1.0$ (where N_{Ed} and M_{Ed} are calculated on specific project basis, and N_{Rd} and M_{Rd} are taken from the values in the above Table).

(3) The bearing strength (B_R) is intended for the verification of panels installed continuously over intermediate support. The bearing strength at the end support should be resisted by including an edge timber in the panel at the support and should be 45 mm minimum.

(4) Axial load is assumed to be applied concentrically or at a maximum eccentricity of width/6 towards the OSB face in service class 1.

(5) The stiffness values and deflection factors must be used to calculate the instantaneous and final deflection according to BS EN 1995-1-1 : 2004.

(6) The out-of-plane deflection of the panel must be verified and limited to L/350 for instantaneous deflection and L/300 for long-term deflection.

(7) The deflection due to shear must be taken into account and every appropriate deflection limit should be defined for each project on a case-by-case basis.

(8) Structural insulated panels transfer any in-plane forces through the OSB/3 outer skin. The facing OSB/3 skin is to be fully supported on both faces of the panel, typically bearing directly on the top and bottom sill.

Table 6 Structural properties – limit state design[1] – 219 mm thick Sips Eco Panel

Strength	Unit	Duration of load				
		Permanent	Long	Medium	Short	Instantaneous
Bending strength[2] (M_{Rd})	kN·m·m^{-1}	3.77	7.91	12.55	16.13	19.71
Shear strength[2] (V_{Rd})	kN·m^{-1}	3.12	5.20	7.80	10.40	10.40
Bearing strength[3] (B_R) min 90 mm	kN·m^{-1}	3.46	5.76	8.64	11.52	11.52
Axial Strength[4][8] (N)						
Wall height <2400 mm	kN·m^{-1}	20.91	39.53	46.89	56.54	69.11
Wall height 2400 to 2700 mm	kN·m^{-1}	19.90	38.20	46.89	56.54	69.11
Wall height 2700 to 3000 mm	kN·m^{-1}	18.88	36.82	46.89	56.54	69.11
Wall height 3000 to 3500 mm	kN·m^{-1}	17.20	34.46	46.89	56.54	69.11
Wall height 3500 to 4000 mm	kN·m^{-1}	15.61	32.07	46.89	56.54	69.11
Wall height 4000 to 4800 mm	kN·m^{-1}	13.29	28.38	46.74	56.54	69.11
Stiffness[5][6][7]						
EI_{inst}	N·mm^2	904.22 E+9				
EI_{perm}	N·mm^2	EI_{inst}/(1+1.87)				
GA_{inst}	N	597.72 E+3				
GA_{perm}	N	GA_{inst}/(1+3.47)				

(1) The strength values in this Table are design values that should be compared to the worst loading case at the ULS. The tabulated strength properties were compared with laboratory test result to verify the calculated values.

(2) When checking a panel under combined loading (axial + bending), use the interaction formula: $N_{Ed} / N_{Rd} + M_{Ed} / M_{Rd} \leq 1.0$ (where N_{Ed} and M_{Ed} are calculated on specific project basis, and N_{Rd} and M_{Rd} are taken from the values in the above Table).

(3) The bearing strength (B_R) is intended for the verification of panels installed continuously over intermediate support. The bearing strength at the end support should be resisted by including an edge timber in the panel at the support and should be 45 mm minimum.

(4) Axial load is assumed to be applied concentrically or at a maximum eccentricity of width/6 towards the OSB face in service class 1.

(5) The stiffness values and deflection factors must be used to calculate the instantaneous and final deflection according to BS EN 1995-1-1 : 2004

(6) The out-of-plane deflection of the panel must be verified and limited to L/350 for instantaneous deflection and L/300 for long-term deflection.

(7) The deflection due to shear must be taken into account and every appropriate deflection limit should be defined for each project on a case-by-case basis.

(8) Structural insulated panels transfer any in-plane forces through the OSB/3 outer skin. The facing OSB/3 skin is to be fully supported on both faces of the panel, typically bearing directly on the top and bottom sill.

6.3 The fixings specified in section 1.3 and Figure 2 of this Certificate, were tested on the panels for pull-out resistance in accordance with BS EN 1382 : 2016; the characteristic withdrawal capacity of screws is given in Table 7 of this Certificate.

Table 7 – Fixings characteristic withdrawal capacity F_{max} (N)[1][2][3]

Panel thickness (mm)	Position	Characteristic withdrawal capacity F_{max} (N)
119	Middle	826

(1) The design value can be derived by using the appropriate factor of safety on the characteristic value.

(2) Test specimen was a nominal 300 x 300 mm panel.

(3) F_{max} is the mean of the applied loads at the fixing's pull-out failure mode.

Racking resistance

6.4 When tested for racking strength and stiffnessess in accordance with BS EN 594 : 2011, the wall panels[1] achieved a basic characteristic racking resistance (R_b)[2] of 2.71 kN.m^{-1} at an applied vertical load of 5 kN. Racking resistance is influenced by the spacing of fixing nails around the perimeter (minimum 50 mm, maximum 150 mm).

(1) Racking was completed on Sips Eco Panel dimensions 2400 x 2490 mm with OSB/3 sheathing on each side. The insulation was a 97 mm core EPS and the timber used was a treated 45 x 95 mm C24 . The fixings used were Simpsons Strong Ties screwed at 150 mm centres, as defined in section 1.3 of this Certificate.

(2) The design racking resistance ($F_{v,Rk}$) for wall panels used may be calculated in accordance with BS EN 1991-1-1 : 2004, using the appropriate partial material factor γ_m and modification factor K_{Mod} – the Certificate holder's advice should be sought.

6.5 The strength of all connection details which tie walls comprising the panels, to other structural elements (such as walls, floors, roofs and solid timber splines) must be evaluated and provide adequate stability for the overall building design. The specification and design for these items must be determined by a suitably qualified chartered structural

engineer responsible for the overall 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. The sizing of lintels must be determined by the chartered structural engineer responsible for the overall design of the building. The formation of openings for windows and doors in panels should only be carried out under approved factory conditions, or alternatively on site, by using individual pre-engineered panels. The structural design of any buildings must take account of the reduction in loadbearing capacity of the panels and the overall stability of the building due to the number and location of openings. Small service openings (such as for pipework for flues) may only be made through the panels on site when agreed by the qualified designer.

6.7 When the panels are used to construct the inner leaf of an external cavity wall, the outer masonry leaf and all masonry below the dpc must be designed and constructed in accordance with BS EN 1996-1-1 : 2005, BS EN 1996-1-2 : 2005, BS EN 1996-2 : 2006 and BS EN 1996-3 : 2006 and their UK National Annexes, and PD 6697 : 2019.

6.8 As part of the structural design, additional timber framing or plywood plating may be provided, and screw-fixed to the OSB inner skin. This will support eccentric loads such as central heating boilers, shelving systems and radiators.

6.9 Stainless steel wall ties (outside the scope of this Certificate) can be directly attached to the OSB/3 face of the panel using Simpson Strong-Tie connectors, nails or stainless-steel screw fasteners as approved by the Certificate holder.

6.10 A structure incorporating the products must be designed by an appropriately qualified chartered structural engineer, to satisfy the requirements of disproportionate collapse in national Building Regulations and BS EN 1991-1-7 : 2006 (Consequence class 1) and its UK National Annex.

7 Thermal performance

7.1 Calculations of thermal transmittance (U value) should be carried out in accordance with BS EN ISO 6946 : 2017 and BRE Report BR 443 : 2019, using the thermal conductivities ($W \cdot m^{-1} \cdot K^{-1}$) listed below, or the 'effective' panel R-values given in Tables 8 of this Certificate.

- EPS insulation core , λ_D 0.03
- OSB, λ 0.13
- Solid timber, λ 0.13.

Table 8 Example panel thermal resistance (R) values ($m^2 \cdot K \cdot W^{-1}$)(1)(2)(3)

	Panel thickness (mm)									
	119		144		169		194		219	
Splines	SIP	Timber	SIP	Timber	SIP	Timber	SIP	Timber	SIP	Timber
R-value	3.30	2.79	4.14	3.46	4.97	4.13	5.81	4.79	6.64	5.46

(1) These panel R values may be used in combined U value calculations where panels are 1197 mm wide.
(2) The panels have been taken to have an air gap correction of 0. For fixings corrections, the guidance in BS EN ISO 6946 : 2017 should be followed.
(3) SIP splines to walls only. Timber splines to wall and roof.

7.2 The U value of a complete element will depend on the selected panel thickness, the amount/type of spline bridging within the panel, spline fixings, and the internal and external finishes(1) and their fixings. Calculated U values for example constructions are given in given in Tables 9 and 10 of this Certificate.

(1) Finishes and their attachment methods are outside the scope of this Certificate.

Table 9 Wall – example thermal transmittance (U) values ($W \cdot m^{-2} \cdot K^{-1}$)[1][2][3]

	Panel thickness (mm)									
Panel	119		144		169		194		219	
Splines	SIP	Timber	SIP	Timber	SIP	Timber	SIP	Timber	SIP	Timber
U value	0.25	0.28	0.21	0.23	0.18	0.20	0.15	0.18	0.14	0.16

(1) These combined U value calculations may be used where panels are 1197 mm wide.

(2) 102.5 mm thick brick external skin (λ = 0.77 $W \cdot m^{-1} \cdot K^{-1}$) and 50 mm clear air cavity (R = 0.18 $m^2 \cdot K \cdot W^{-1}$), breather membrane, Sips Eco panel, AVCL membrane, 25 mm services cavity (R = 0.18 $m^2 \cdot K \cdot W^{-1}$, with 11.8 % timber battens, λ = 0.13 $W \cdot m^{-1} \cdot K^{-1}$), finished internally with 12.5 mm thick dense plasterboard (λ = 0.25 $W \cdot m^{-1} \cdot K^{-1}$).

(3) The panels have been taken to have an air gap correction of 0. For fixings corrections, the guidance in BS EN ISO 6946 : 2017 should be followed.

Table 10 Roof – Example thermal resistance (U) values ($W \cdot m^{-2} \cdot K^{-1}$)[1][2][3]

Panel	Panel thickness (mm)			
	144	169	194	219
U value	0.25	0.22	0.19	0.17

(1) These combined U value calculations may be used where panel centres are 1197 mm.

(2) Slates/tiles, well ventilated counter-battened air space, LR roof tile underlay, Sips Eco panel (timber spline), AVCL membrane, 25 mm services cavity (R = 0.16 $m^2 \cdot K \cdot W^{-1}$, with 11.8 % timber battens, λ = 0.13 $W \cdot m^{-1} \cdot K^{-1}$), finished internally with 12.5 mm thick dense plasterboard (λ = 0.25 $W \cdot m^{-1} \cdot K^{-1}$).

(3) Panels have been taken to have an air gap correction of 0. For fixings corrections, the guidance in BS EN ISO 6946 : 2017 should be followed.

Junctions

7.3 The products can contribute to maintaining continuity of thermal insulation around openings and between panels. Care must be taken in the overall design and construction of junctions with other elements to minimise thermal bridges and air infiltration. Detailed guidance can be found in the documents supporting the national Building Regulations.

8 Condensation

Surface condensation

8.1 The risk of surface condensation under normal domestic use is acceptable for elements, junctions and openings in accordance with section 7.3.

Interstitial condensation

8.2 Elements will adequately limit the risk of interstitial condensation when they are designed and constructed in accordance with BS 5250 : 2021 and, for flat roofs, BS 6229 : 2018, using the following water vapour diffusion factors (μ):

- EPS insulation core 60
- OSB 50 (external side), 30 (internal side).

8.3 Example calculations to BS 5250 : 2021 show that the risk of interstitial condensation of the external walls/roofs given in Tables 9 and 10 of this Certificate (for humidity class 4) will be minimal.

8.4 A 25 mm service void is recommended to the internal plasterboard for walls and roofing. LR (low resistance) roof underlays will be fully supported and should be treated as HR (high resistance) for the purpose of interstitial condensation calculations.

8.5 A breather membrane (maximum vapour resistance of 0.6 $MN \cdot s \cdot g^{-1}$) and a LR underlay (minimum vapour resistance of 0.25 $MN \cdot s \cdot g^{-1}$) is recommended, and a vapour check (such as minimum 500 gauge polyethylene AVCL) is recommended to the warm side.

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

9 Behaviour in relation to fire

Reaction to fire

9.1 The Certificate holder has not declared a reaction to fire classification for the panels to BS EN 13501-1 : 2018.

9.2 Cavity barriers should be applied in accordance with the relevant national Building Regulations.

9.3 In England, Wales and Northern Ireland, the panels should not be used in external walls of buildings that have a storey at least 18 m above ground level.

9.4 In Scotland, the panels may be used in external walls of buildings with no storey 11 m or more above the ground, and more than 1 m from a boundary. The panels should not be used as infill panels in external walls of buildings with a storey 11 m or more above the ground.

Resistance to fire

9.5 When tested to BS EN 1365-1 : 2012 and classified in accordance with BS EN 13501-2 : 2016, SIPS Eco Panels achieved the result shown in Table 11 of this Certificate.

Table 11 Resistance to fire classification to BS EN 13501-2 : 2016

Performance[1]	Applied load (kN)	Wall construction[2]	Test Reference Report Number
REI 120	30.0	- 2 layers of 15 mm thick Gyproc Fireline plasterboard with staggered joints - 119 mm SIPs ECO Panel joined with 95 x 45 mm C24 grade timber splines - 2 layers of 15 mm thick Gyproc Fireline plasterboard with staggered joints	BRE Global Test Report no P118943-1000, Issue 1

(1) The results of the fire test are directly applicable to similar constructions where one or more of the changes listed below are made and the construction continues to comply with the appropriate design code for its stiffness and its stability.

a) Decrease in height
b) Increase in the thickness of the wall
c) Increase in the thickness of component materials
d) Decrease in linear dimensions of boards or dimensions of panels except thickness
e) Decrease in stud spacing
f) Decrease in distance of fixing centres
g) Increase in the number of horizontal joints when tested with one joint not more than 500 mm ± 150 mm from the top edge
h) Decrease in the applied load.
i) Increase in the width, provided that the test specimen was tested at full width or 3 m wide, whichever is the larger.

(2) Designers should refer to the test report for full details of the tested construction – copies are available from the Certificate holder.
(3) Tested partition 2970 x 2970 x 179 mm.

9.6 Where any other form of wall construction incorporating the panels (including any service penetrations) is required to achieve a period of fire resistance, its performance should be confirmed by a suitably qualified and experienced individual or by a test carried out from a United Kingdom Accreditation Service (UKAS)-approved or suitably approved testing laboratory.

Roofs

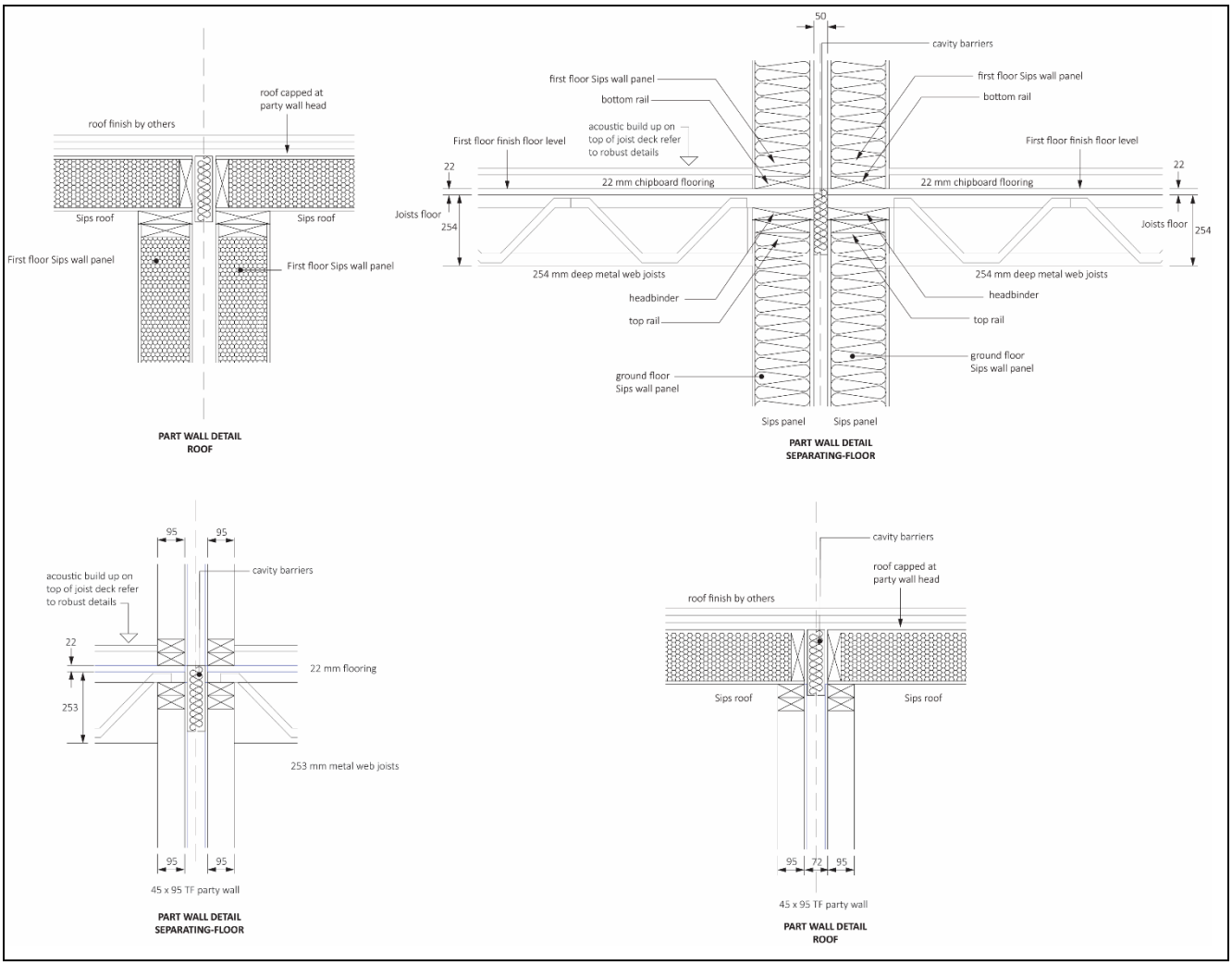
9.7 The resistance to external fire exposure of a roof incorporating the panels will depend on the specification of the roof covering used.

Junctions

9.8 Junctions between walls incorporating the panels, or other fire-resisting elements, must maintain the required period of fire resistance.

9.9 Where the panels are to be 'carried over' compartment walls, designers must ensure that the roof/wall junction detail provides sufficient resistance to fire penetrating into the neighbouring compartment.

Figure 3 Separating wall details



10 Air permeability

10.1 The panels can contribute to achieving adequate resistance to unwanted air infiltration provided there is effective sealing around junctions.

10.2 A proportion of completed buildings in a development are subject to pre-completion airtightness. Exceptions for small developments can be found in the documents supporting the national Building Regulations.

11 Proximity of flues and appliances

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

12 Resistance to airborne sound

12.1 Separating walls may be in the form of double party walls and are subject to pre-completion testing.

12.2 Good working practices should be adopted for sealing all joints. Double or triple layers of plasterboard should be staggered. Relevant practices detailed within the relevant regulatory guidance must be adopted.

12.3 Acoustic testing data on separating walls in accordance with BS EN ISO 140-4 : 1998, indicate that the separating wall constructions detailed in Table 12 of this Certificate have the resistances to airborne sound transmission stated, and the panels will contribute to a wall satisfying the requirements for reducing sound transmission in party walls.

Table 12 Airborne sound insulation (dB)

Test no	Performance $D_{nT,w}$ (C_{tr}) (1)	Performance $D_{nT,w}$ +C_{tr} (1)	Separating wall construction	Test Reference Report Number(1)
10650S-1	64 (-12) *dB*	52 *dB*	2 layers of 15 mm wallboard, 25 mm timber battens with 25 mm RW3 mineral wool insulation between, 119 mm Sips Eco Panel (11 mm OSB/97 mm EPS/11 mm OSB) 60 mm cavity with 50 mm Knauf RS45 mineral wool, 119 mm Sips Eco Panel (11 mm OSB/97 mm EPS/11 mm OSB) 25 mm timber battens with 25 mm RW3 mineral wool insulation between, 2 layers of 15 mm wallboard	Sound Testing Acoustic Consultancy Test Report Ref no 10650S
10650S-2	61 (-11) *dB*	50 *dB*		

(1) Copies of the test report can be provided by the Certificate holder.

12.4 It is essential that care is taken in the 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 1996-1-1 : 2005, BS EN 1996-2 : 2006 and BS EN 1996-3 : 2006 and their UK National Annexes, and PD 6697 : 2019, and must incorporate damp-proof courses and cavity trays. A breather membrane is required with this type of construction.

13.2 When used with other outer leaf construction, the final weather resistance of the building is dependent upon the efficient positioning and sealing of all joints. The guidance given in BRE Report BR 262 : 2002, Section 3, should be followed with regard to rain penetration; the designer must select 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 detailed in accordance with BS 5534: 2018 and BS 6229 : 2018 to ensure moisture is prevented from coming into contact with the panels.

14 Maintenance and repair

14.1 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.

14.2 Minor repairs to the products can be carried out to the wall panels prior to erection in accordance with the Certificate holder's construction *Installation manual.*

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, a service 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.

16 Reuse and recyclability

The panels are made of OSB/3 board and EPS, both of which can be recycled.

Installation

17 General

17.1 SIPS Eco Panels should be installed by operatives who have been trained and assessed by the Certificate holder to undertake the work. Any installation work should follow the details and information contained in the construction drawings, as prepared by the Certificate holder.

17.2 Erection of the wall and roof panels must comply with the details given in the Certificate holder's construction *Installation manual* and the provisions of this Certificate.

17.3 When used in loadbearing and non-loadbearing applications, the main contractor must ensure that the accuracy of the foundation is in accordance with the Certificate holder's construction *Installation manual.* The following details must be within the following tolerances in respect of line, level and squareness:

- the level of the foundation or other bearing support — ±5 mm
- the overall width and length of the building footprint and individual wall lengths — within ±3 mm
- the diagonals used for checking the overall squareness of the building(1) — ±5 mm.

(1) Adjustment may be possible through the sole plates.

17.4 When using the SIP 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:

- panels to be held in place with proprietary brackets to the chartered structural engineer's specification
- a 5 mm gap should be left at the head of the infill panel to allow for expansion/differential movement. The gap should be filled with an expanding urethane foam or proprietary compressible foam.

17.5 Guidance on the procedures for installing the infill panels is limited due to the variations in the structural frame construction and detailing. Erection methods for lifting non-loadbearing wall panels into place, specification and design brackets, fixings and tolerances will therefore need to be determined by an experienced and suitably qualified design engineer for each structure in which the infill wall panels are used. Further guidance can be obtained from the Certificate holder.

18 Procedure (loadbearing construction)

Foundation construction

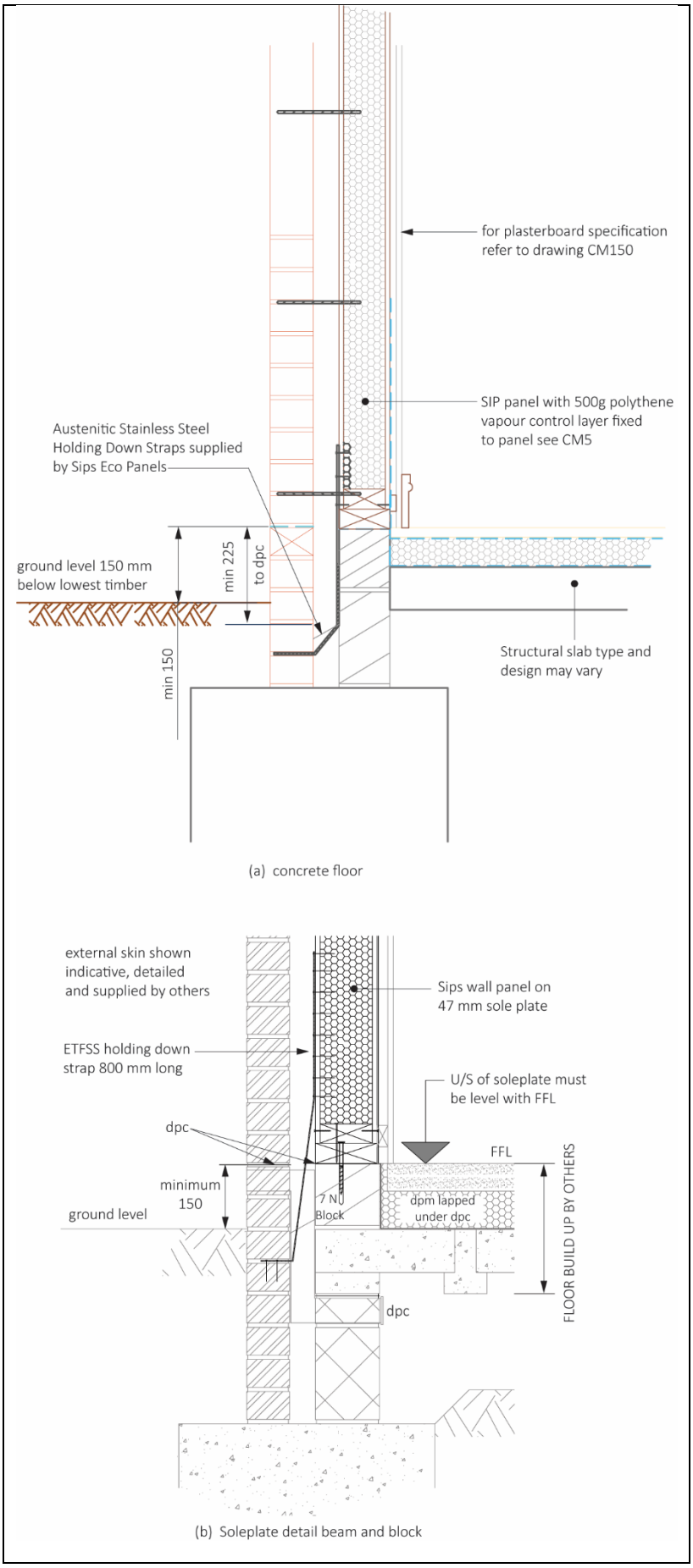
18.1 A suitable dpc must be laid on top of the foundation and the finished floor must be equal to, or above, the external dpc level, in accordance with Certificate holder's construction *Installation manual.*

18.2 Treated timber (C16 grade or above) sole plates, 45 mm thick, are fixed through the dpc to the concrete slab foundation to form the inner leaf of the external walls and internal loadbearing walls of the construction.

18.3 The stud end closures (with thickness appropriate to panel width by 45 mm), treated-timber bottom rail is removed from the panel(1) and fixed centrally to the plate and double nailed using Paslode galvanized nails or the Certificate holder's approved method (see Figure 4). Any tolerances to the sole plates should be adjusted as per the instructions in the Certificate holder's construction *Installation manual*.

(1) The top and bottom rails are supplied attached to the panel for transportation purposes.

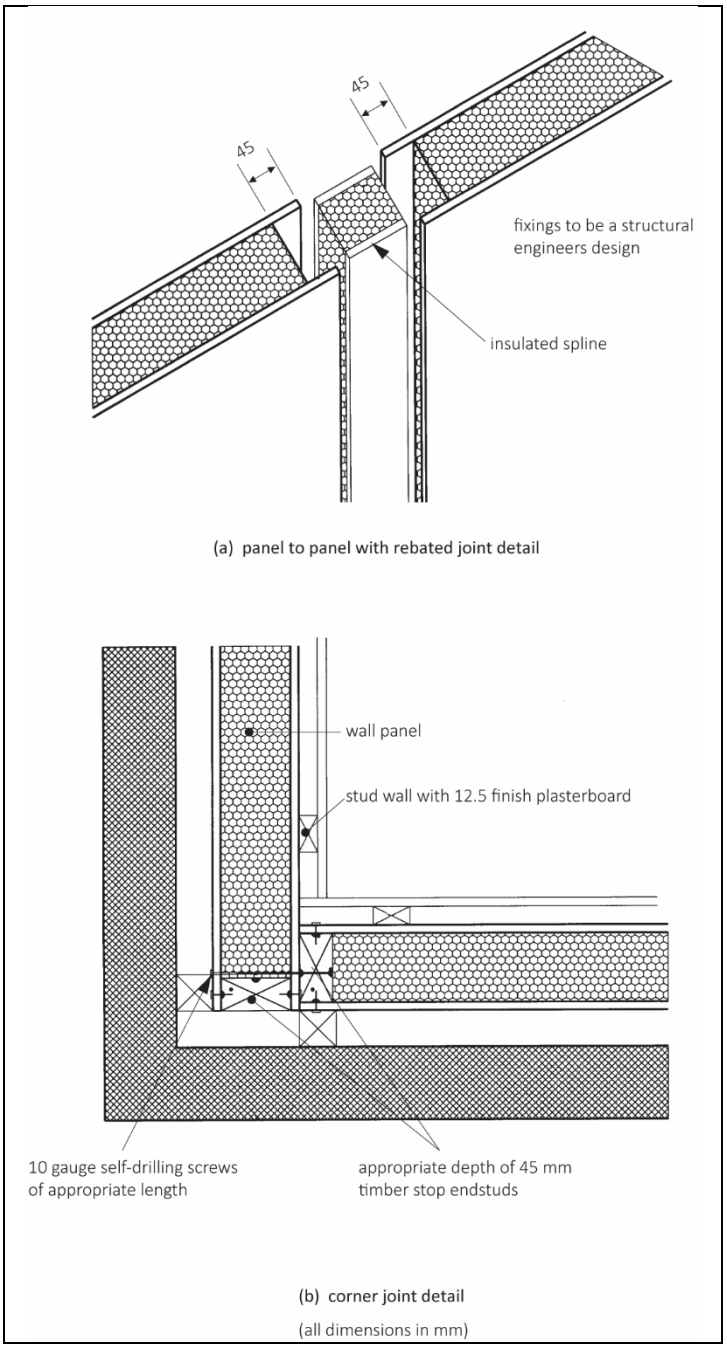
Figure 4 Ground floor detail



External wall construction

18.4 Installation of the panels is carried out in a predetermined sequence (usually starting at one corner), ensuring that the panels are aligned accurately. The bottom rail has a bead of silicone sealant applied along both sides of its length, prior to the panels being craned and positioned on top. The bottom rail joints must run at least one metre over the panel edges. The panel is checked, adjusted and braced using props, and fixed to the bottom rail using fixings, as specified by the structural engineer's design. See Figure 5.

Figure 5 Wall construction detail



Internal wall construction

18.5 The next panel in the sequence is craned in and onto the sealant-applied bottom rail and installed and braced. Corner panels are fixed using screws as described in section 1.3, and at centres to the chartered engineer's design requirements. Adjoining panels on the same plane are fixed with an end closure and secured on both sides using screws as approved by the Certificate holder and at centres to the chartered engineer's design requirements. The top rail is either fitted after all the panels are installed or in stages during the wall construction. A bead of silicone is applied along the inside face of the rebated edge of the panel and the top rail slipped into position, ensuring the rail continues at

least one metre over the panel joints. The top rail is fixed on either side of the panel using screws as described in section 1.3, and at centres to the chartered engineer's design requirements.

18.6 Where required, a breather membrane can be installed at this stage in accordance with the Certificate holder's construction *Installation manual* ensuring correct horizontal and vertical overlaps are maintained as advised.

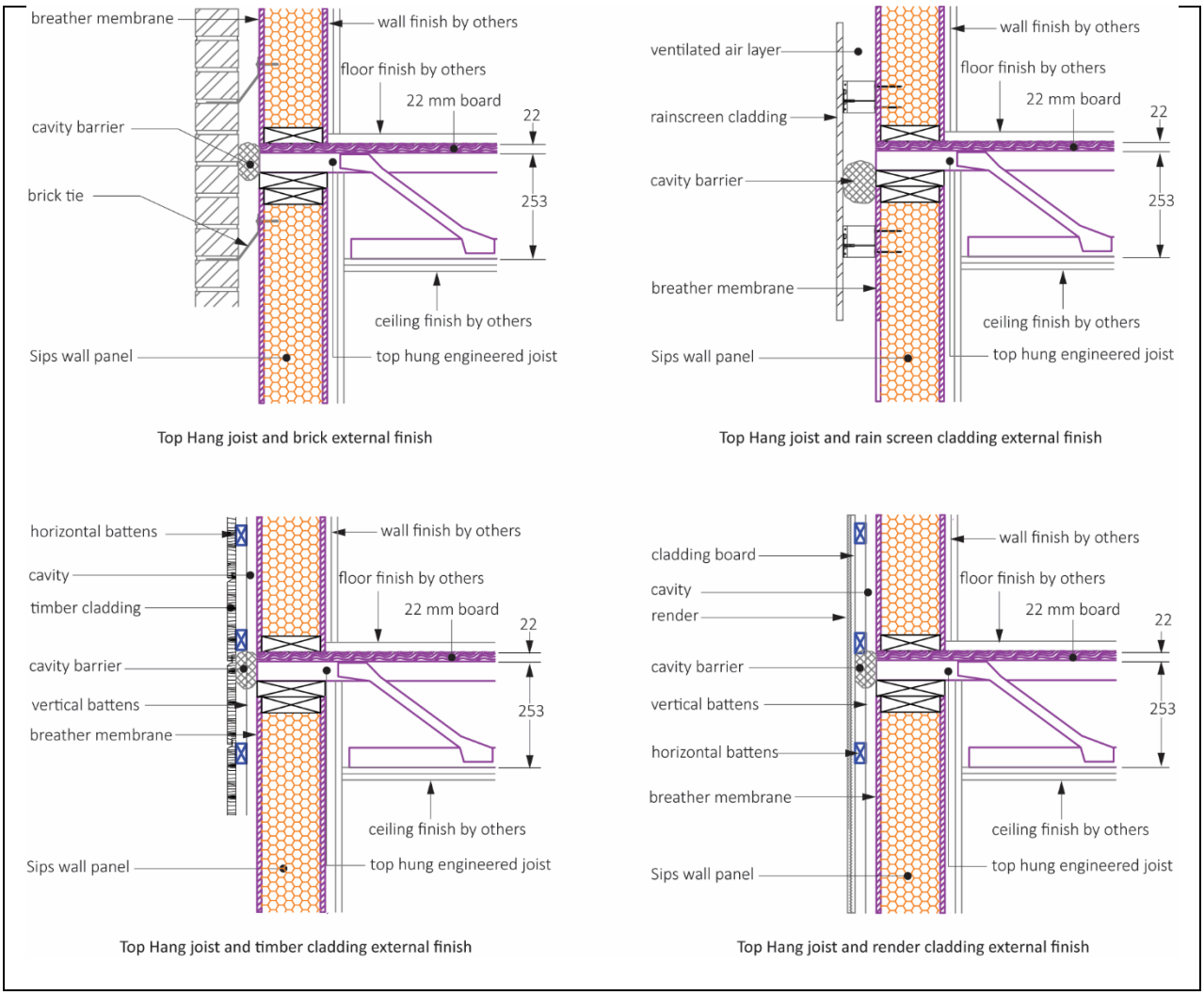
Intermediate floor construction

18.7 The intermediate floor is constructed on the top rail and can be joist-fixed to a timber/engineered timber rim board, top hung joists or joists on appropriate hangers, as designed and required by the structural engineer. A diagonal measurement is taken at the opposing corners to ensure squareness, prior to the pre-cut joists being positioned and secured through the rim board using nail/screw fixings recommended by the Certificate holder.

18.8 The floor deck can either be added at this stage and subsequent second-storey panels fixed directly to the floor without the need for a sole plate, or the panels can be erected first with the use of sole plates, with the floor finish added afterwards (see Figure 6). Subsequent floor panels are installed in the same manner as the ground floor (see sections 18.2 to 18.6).

18.9 At the gable end, the panels are turned on their side 90 degrees and the length cut to the angle of the roof line. The panels are secured to the intermediate floor by 250 by 6 mm screws. The panel is finished with a top rail and closing plate and secured as described in section 18.5.

Figure 6 Intermediate floor detail



Roof construction

18.10 The supporting walls are made fully rigid by nail/screw fixings as described in section 1.3 and intermediate/ridge beams/purlins in accordance with the design requirements, which are incorporated within preformed positions in the wall panel.

18.11 Joists are installed to support the front and back wall panels and internal loadbearing walls as required. The ridge beam and purlins are then craned in and supported at each gable and supporting walls.

18.12 The wall heads are marked out with the position of the rafters. The rafters are lifted onto the wall heads and supported using galvanized straps and braced through to the supporting structural timber element following the chartered engineer's design requirements.

18.13 Alternatively, the roof structure can be constructed at ground level and lifted into position when completed.

18.14 The roof panels can be craned onto the rafters and fixed to the ridge beam and purlins, using the Certificate holder's recommended fixings as described in section 1.3. Where the roof panel and wall panel meet, a timber framework (incorporating soffit/fascia board detail) is secured to provide the completed roof.

18.15 Where ridge lengths exceed the 4.8 m maximum panel length, a panel would traverse from the ridge to a support and a second panel of appropriate dimensions from support to eaves. This support can either be in the form of a purlin running between gable ends or a panel upstand supported on the joists, following the chartered engineer's design requirements. A variety of roof finishes can be adopted, subject to the Certificate holder's recommendations but this is outside the scope of this Certificate.

Infill panel application

18.16 The panels are prepared in the same way as for the wall panels (described in sections 17.4, 17.5 and 18.5 to 18.9). The panels can be fixed inside the structural frame of a building, as an infill panel between structural load-bearing elements (eg concrete posts). Typically, the panel is secured to the structural frame using infill screw fixings and tolerances as recommended by the chartered engineer. At floor level, the screws are fixed through the panels to a continuous steel angle bracket; at ceiling level, they are fixed through the panels to angled cleats with slotted fixing connections, to allow for differential movement.

Technical Investigations

19 Tests

Tests were carried out and the results assessed to determine:

- flexural/bending strength
- racking resistances in accordance with BS EN 594 : 2011
- axial and eccentric loading resistances
- pull-out capacity of fixings
- tensile and shear resistances
- fire performance.

20 Investigations

20.1 An examination was made of technical data relating to:

- structural properties and design calculations
- fire resistance
- airborne sound insulation tests
- thermal performance and condensation risk assessment to BS 5250 : 2021.

20.2 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.

20.3 A condensation risk assessment to BS 5250 : 2021 was undertaken for a typical wall and roof construction.

Bibliography

BRE Digest 369 *Interstitial condensation and fabric degradation*

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

BRE Report BR 443 : 2019 *Conventions for U-value calculations*

BS 5250 : 2021 *Code of practice for control of condensation in buildings*

BS 5534 : 2014 + A2 : 2018 *Slating and tiling for pitched roofs and vertical cladding — Code of practice*

BS 6229 : 2018 *Flat roofs with continuously supported coverings — Code of practice*

BS 8000-3 : 2001 *Workmanship on building sites — Code of practice for masonry*

BS 8215 : 1991 *Code of practice for design and installation of damp-proof courses in masonry construction*

BS 8417 : 2011 + A1 : 2014 *Preservation of wood — Code of practice*

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

BS EN 594 : 2011 *Timber structures — Test methods — Racking strength and stiffness of timber frame wall panels*

BS EN 845-1 : 2013 + A1 : 2016 *Specification for ancillary components for masonry — Wall ties, tension straps, hangers and brackets*

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

BS EN 1382 : 2016 *Timber Structures — Test methods — Withdrawal capacity of timber fasteners*

BS EN 1991-1-7 : 2006 + A1 : 2014 *Eurocode 1 : Actions on structures – General actions – Accidental actions*
NA + A1 : 2014 to BS EN 1991-1-7 : 2006 + A1 : 2014 UK National Annex to *Eurocode 1 : Actions on structures – General actions – Accidental actions*

BS EN 1995-1-1 : 2004 + A2 : 2014 *Eurocode 5 : Design of timber structures — General — Common rules and rules for buildings*

BS EN 1996-1-1 : 2005 + A1 : 2012 *Eurocode 6 : Design of masonry structures — General rules for reinforced and unreinforced masonry structures*
NA to BS EN 1996-1-1 : 2005 + A1 : 2012 UK National Annex to *Eurocode 6 : Design of masonry structures — General rules for reinforced and unreinforced masonry structures*

BS EN 1996-1-2 : 2005 + A2 : 2014 *Eurocode 5 : Design of timber structures — General — Common rules and rules for buildings*
NA to BS EN 1996-1-2 : 2005 + A2 : 2014 UK National Annex to *Eurocode 5 : Design of timber structures — General — Common rules and rules for buildings*

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

BS EN 1996-3 : 2006 *Eurocode 6 : Design of masonry structures — Simplified calculation methods for unreinforced masonry structures*
NA + A1 : 2014 to BS EN 1996-3 : 2006 UK National Annex to *Eurocode 6 : Design of masonry structures — Simplified calculation methods for unreinforced masonry structures*

BS EN 13501-1 : 2018 *Fire classification of construction products and building elements — Classification using data from reaction to fire tests*

BS EN 13501-2 : 2016 *Fire classification of construction products and building elements — Classification using data from fire resistance tests, excluding ventilation services*

BS EN ISO 140-4 : 1998 *Acoustics — Measurement of sound insulation in buildings and of building elements — Field measurements of airborne sound insulation between rooms*

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

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

BS EN ISO 16283-1 : 2014 + A1: 2017 *Acoustics — Field measurement of sound insulation in buildings and of building elements — Airborne sound insulation*

PD 6697 : 2019 *Recommendations for the design of masonry structures to BS EN 1996-1-1 and BS EN 1996-2*

21 Conditions

21.1 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.

21.2 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.

21.3 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.

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

21.5 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.

21.6 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.