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BBA APPROVAL INSPECTION TESTING CERTIFICATION
TECHNICAL APPROVALS FOR CONSTRUCTION

Agrément Certificate
09/4659
Product Sheet 1

SUPAWALL PANELS

SUPAWALL, SUPAFLOOR AND SUPAROOF PANELS

PRODUCT SCOPE AND SUMMARY OF CERTIFICATE

This Certificate relates to SupaWall, SupaFloor and SupaRoof Panels, for use above the damp-proof course in constructions up to four storeys high (including room-in-roof) as the loadbearing inner leaf of an external wall, a loadbearing internal wall, single or double leaves of a separating wall, floor panels or pitched/flat roofing panels.

AGRÉMENT 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

Structural performance — the panels have adequate strength to resist the loads associated with in-service loading (see section 5).
Condensation risk — walls, floors and roofs, openings and junctions with other elements will adequately limit the risk of surface condensation (see section 6).
Thermal performance — the panels contribute to the overall thermal performance of the building construction (see section 7).
Behaviour in relation to fire — the structural external and separating walls formed from the panels provide sufficient fire protection when constructed in accordance with the requirements of UK Building Regulations and of BS 5268-2 : 2002 (see section 9).
Sound insulation — separating walls with additional plasterboard, soundproof linings and detailing shown in this Certificate will provide sufficient sound resistance (see section 11).
Durability — the panels will have a 60-year minimum service life provided that they are protected from damage by the external and internal finishes (see section 14).

The BBA has awarded this Agrément Certificate to the company named above for the products described herein. These products has 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: 28 April 2009

Brian Chamberlain
Head of Approvals — Engineering

Greg Cooper
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

Regulations

In the opinion of the BBA, SupaWall, SupaFloor and SupaRoof Panels, if used in accordance with the provisions of this Certificate, will meet or contribute to meeting the relevant requirements of the following Building Regulations:

The Building Regulations 2000 (as amended) (England and Wales)

Requirement:	A1	Loading
Comment:		Walls, floors and roofs constructed from the panels will have sufficient strength and stiffness when designed in accordance with sections 5.1 to 5.3 and 5.5 to 5.7 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 9.1 to 9.3 and 9.5 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 6.1 and 6.2 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 11.1 to 11.3 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 11.2 of this Certificate.
Requirement:	L1(a)(i)	Conservation of fuel and power
Comment:		Walls, floors and roofs can contribute to a building meeting its Target Emission Rate. See sections 7.1 to 7.4 and also sections 8.1, 8.2 and 8.3 of this Certificate.
Requirement:	Regulation 7	Materials and workmanship
Comment:		The products are acceptable. See sections 14.1 and 14.2 and the *Installation* part of this Certificate.

The Building (Scotland) Regulations 2004 (as amended)

Regulation:	8(1)(2)	Fitness and durability of materials and workmanship
Comment:		The panels can contribute to a construction meeting this Regulation. See sections 13.1 to 13.2, 14.1 and 14.2 and the *Installation* part of this Certificate.
Regulation:	9	Building standards — construction
Standard:	1.1(a)	Structure
Comment:		Walls, floors and roofs incorporating the system panels will have sufficient strength and stiffness when designed and constructed in accordance with sections 5.1 to 5.3 and 5.5 to 5.7 of this Certificate, with reference to clause 1.1.1[1] of this Standard.
Standard:	2.2	Separation
Comment:		Walls using the appropriate lining, can achieve a 'medium' duration of fire resistance, with reference to clauses 2.2.1[1], 2.2.2[1], 2.2.4[1] and 2.2.5[1]. See sections 9.1 and 9.2 of this Certificate. See also sections 9.4 and 9.5 of this Certificate, with reference to clauses 2.2.7[1] and 2.2.10[1] respectively.
Standard:	2.3	Structural protection
Comment:		Walls using the appropriate lining can achieve a period of fire resistance of 'medium' duration, with reference to clauses 2.3.1[1] and 2.3.3[1]. See sections 9.1 and 9.2 of this Certificate. See also section 9.4 of this Certificate, with reference to clause 2.3.2[1].
Standard:	2.4	Cavities
Comment:		Cavities in wall and roof constructions must incorporate suitable cavity barriers, with reference to clauses 2.4.1[1], 2.4.2[1] and 2.4.7[1]. See sections 9.3, 9.5 and 9.6 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]. See sections 9.1 and 9.2 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]. See sections 6.1 and 6.2 of this Certificate.
Standard:	5.1	Resisting sound transmission to dwellings using appropriate constructions
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] and 5.1.12[1]. See section 11.1 of this Certificate.
Standard:	6.2	Building insulation envelope
Comment:		The panels will enable a wall or roof to satisfy the Elemental Method of limiting fabric heat loss, with reference to clause 6.2.1[1]. The panel junctions and openings can also adequately limit heat loss by conduction and by air infiltration, with reference to clauses 6.2.4[1][2] and 6.2.5[1] respectively. See sections 7.1 to 7.4, 8.1 and 8.4 of this Certificate.

(1) Technical Handbook (Domestic).

(2) Technical Handbook (Non-Domestic).

The Building Regulations (Northern Ireland) 2000 (as amended)

Regulation:	B2	Fitness of materials and workmanship
Comment:		The panels are acceptable. See sections 14.1 and 14.2 and the *Installation* part of this Certificate.
Regulation:	B3(2)	Suitability of certain materials
Comment:		The panels are acceptable. See sections 13.1 to 13.3 of this Certificate.
Regulation:	C5	Condensation
Comment:		The panels will contribute to minimising the risk of interstitial condensation. See section 6.2 of this Certificate.
Regulation:	D1	Stability
Comment:		Walls, floors and roofs constructed from the panels will have sufficient strength and stiffness when designed and constructed in accordance with sections 5.1 to 5.3 and 5.5 to 5.7 of this Certificate.
Regulation:	E4(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 9.1 to 9.3 and 9.5 of this Certificate.
Regulation:	F2	Conservation measures
Comment:		The panels will enable a wall or roof to satisfy the Elemental Method of limiting fabric heat loss. See sections 7.1 to 7.4, 8.1 and 8.3 of this Certificate.
Regulation:	G2(1)	Separating walls and separating floors
Comment:		When installed with suitable flanking elements, separating walls incorporating the panels can satisfy this Regulation. See section 11.1 of this Certificate.

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

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

See section: 1 *Description* (1.3), 2 *Delivery and site handling* (2.1 and 2.3) and 4 *Practicability of installation*.

Non-regulatory Information

NHBC Standards 2008

NHBC accepts the use of SupaWall, SupaFloor and SupaRoof Panels, when installed and used in accordance with this Certificate, in relation to *NHBC Standards*, Chapters 5.2, 6.2, 6.4 and 7.2.

Zurich Building Guarantee Technical Manual 2007

In the opinion of the BBA, SupaWall, SupaFloor and SupaRoof Panels, when installed and used in accordance with this Certificate, satisfies the requirements of the *Zurich Building Guarantee Technical Manual*, Section 3 *Substructure*, Sub-section *Floors* and Section 4 *Superstructure*, Sub-sections *External walls — timber frames — sole plates, Upper floors – timber, Pitched roofs* and *Flat roofs*.

General

This Certificate relates to SupaWall, SupaFloor and SupaRoof Panels, a loadbearing and non-loadbearing closed timber and insulated framed panel system, used in the construction of walls, floors and roofs in buildings. Each panel is manufactured from solid-timber framing with suitable sheathing and with rigid polyurethane insulation injected within the panel voids. Loadbearing wall panels are for use above the damp-proof course (dpc) in constructions up to four storeys high (including room-in-roof) as the loadbearing inner leaf of an external cavity wall or as part of a separating wall and as internal walls.

It is essential that the system is designed in accordance with the Certificate holder's recommendations and all constructions incorporating the system designed and approved by a suitably qualified engineer.

Installation must be carried out by contractors approved by the Certificate holder.

Technical Specification

1 Description

1.1 SupaWall, SupaFloor and SupaRoof Panels (see Figure 1) are structural elements consisting of a solid timber framing internal and external sheathing of oriented strand board, Type 3 (OSB/3) to BS EN 300 : 2006, with an insulation core of closed-cell, zero-rated, Ozone-Depleting Potential, polyurethane (PUR). The sheathing extends past the bottom rail of the panel to facilitate fixing to the soleplate and also at the head rail to allow fixing to a headbinder or ringbeam. Panels are designed with a male and female jointing system for fixing panels together, both for straight runs and at corners (see Figure 10). The corner jointing studs are normally fixed on site to facilitate easier transporting and stacking.

Figure 1 SupaWall, SupaFloor and SupaRoof panels

1.2 The panels can be made in any transportable length and width subject to design criteria and lifting limitations. Panels are connected together by the use of chamfered end studs and rebated edges for panel vertical joints and corner junctions.

1.3 SupaWall (see Figure 1) is a prefabricated, structural, timber-frame, insulated wall panel comprising:

- internal sheathing — OSB/3 to BS EN 300 : 2006 or plywood to BS EN 636 : 2003, 9 mm minimum thickness
- studs — 38 mm by 89 mm to 38 mm by 235 mm, strength grade C16 and C24 timber framing members to BS EN 519 : 1995 and BS 4978 : 1996, at 600 mm maximum centres
- sole (see Figure 2) and head plates — 38 mm by 89 mm to 38 mm by 235 mm timber members to BS EN 519 : 1995 and BS 4978 : 1996, with chamfered vertical edges
- external sheathing studs — OSB/3 to BS EN 300 : 2006 or plywood to BS EN 636 : 2003, 9 mm minimum thickness
- insulation to internal voids — expanded polyurethane foam PUR to one specification
- insulation to external face of panel — 50 mm thick PUR to one specification
- fixings — nails of galvanized, sherardized or austenitic stainless steel, typically 3 mm diameter by 50 mm long, nailing centres:

  OSB sheathing panels:

  — at perimeter, 100 mm

  — internal studs, 300 mm.

  floor decking (fixing to joists):

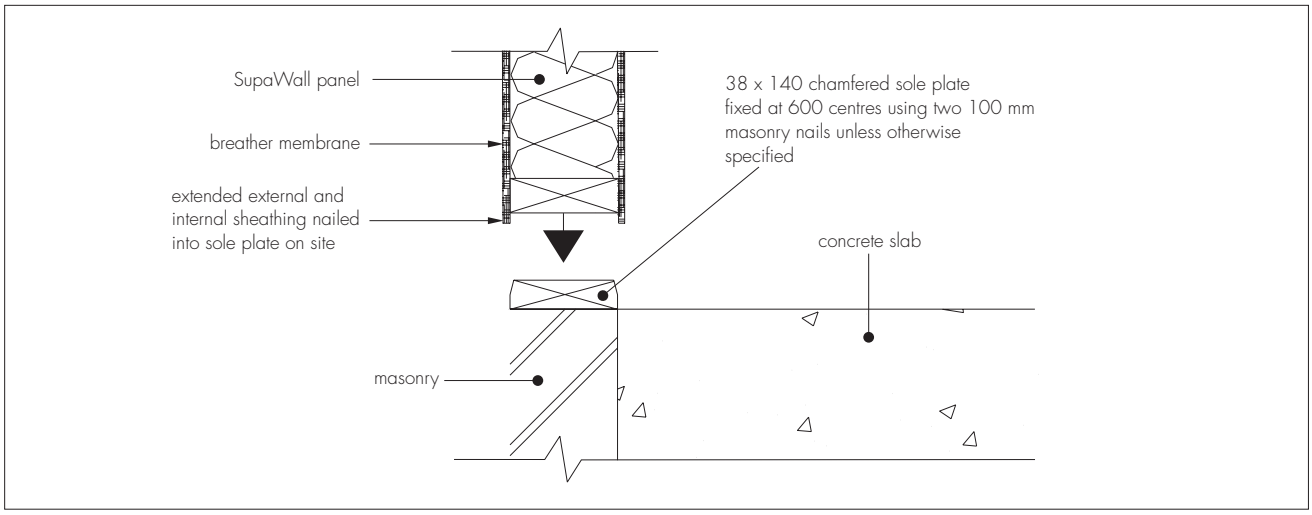
  — at perimeter, 200 mm to 300 mm

  — on intermediate supports, 400 mm to 500 mm[1].

(1) Unless the Certificate holder recommends a lesser distance.

- adhesive (sheathing to framing) — polyurethane wood glue to defined specification.

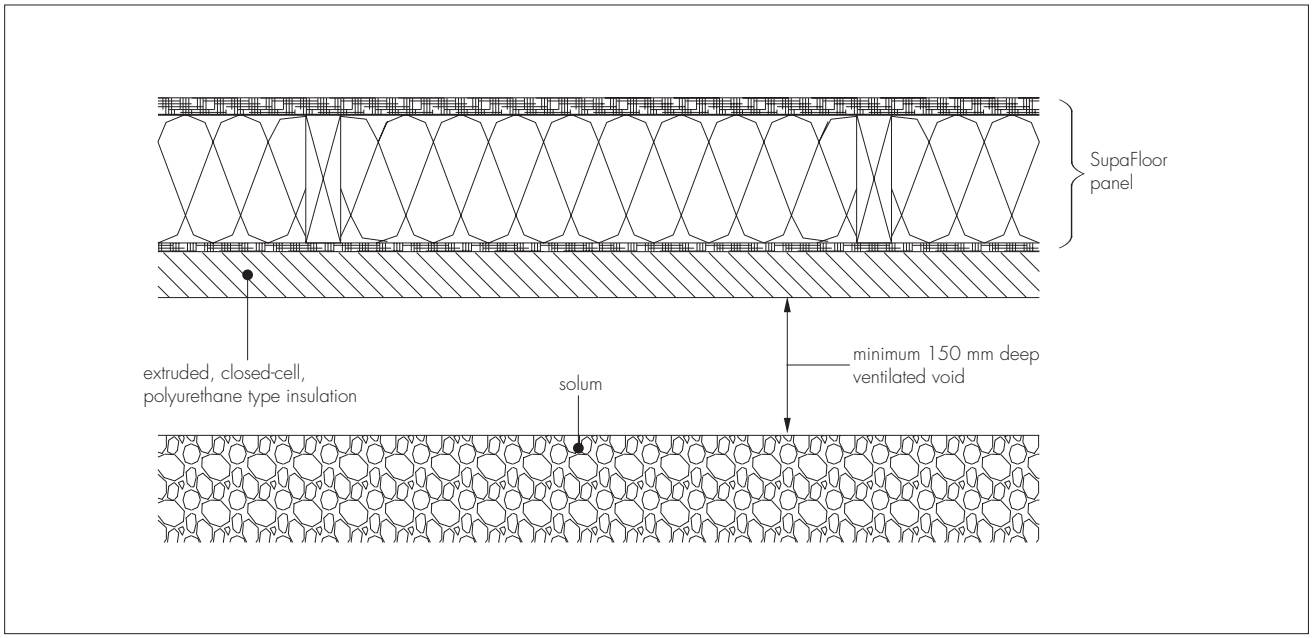
Figure 2 Soleplate details



1.4 SupaFloor is a prefabricated, structural, timber-frame, insulated floor panel (see Figure 3) comprising:

- soffit sheathing — OSB/3 to BS EN 300 : 2006 or plywood to BS EN 636 : 2003, 9 mm minimum thickness
- joists — 38 mm minimum wide by 235 mm maximum deep, strength grade C16 and C24 timber framing members at 600 mm maximum centres
- end binders — 38 mm wide by 235 mm maximum deep, strength grade C16 and C24 timber framing members
- decking — OSB/3 to BS EN 300 : 2006 or plywood to BS EN 636 : 2003, 18 mm minimum thickness
- insulation to internal voids — expanded polyurethane foam PUR to one specification
- fixings — nails of galvanized, sherardized or austenitic stainless steel
- adhesive (sheathing to framing) — polyurethane wood glue to defined specification.

Figure 3 Ground-floor panel



1.5 SupaRoof is a prefabricated, structural, timber-frame, insulated roof panel (see Figures 4 and 5) comprising:

- soffit sheathing — OSB/3 to BS EN 300 : 2006 or plywood to BS EN 636 : 2003
- joists — 38 mm minimum wide by 235 mm maximum deep, strength grade C16 and C24 timber framing members at 600 mm maximum centres
- end binders — 38 mm wide by 235 mm maximum deep, strength grade C16 and C24 timber framing members
- decking — OSB/3 to BS EN 300 : 2006 or plywood to BS EN 636 : 2003, 9 mm minimum thickness
- insulation to internal voids — PUR to one specification
- fixings — nails of galvanized, sherardized or austenitic stainless steel
- adhesive (sheathing to framing) — polyurethane wood glue to defined specification.

Figure 4 Eaves detail

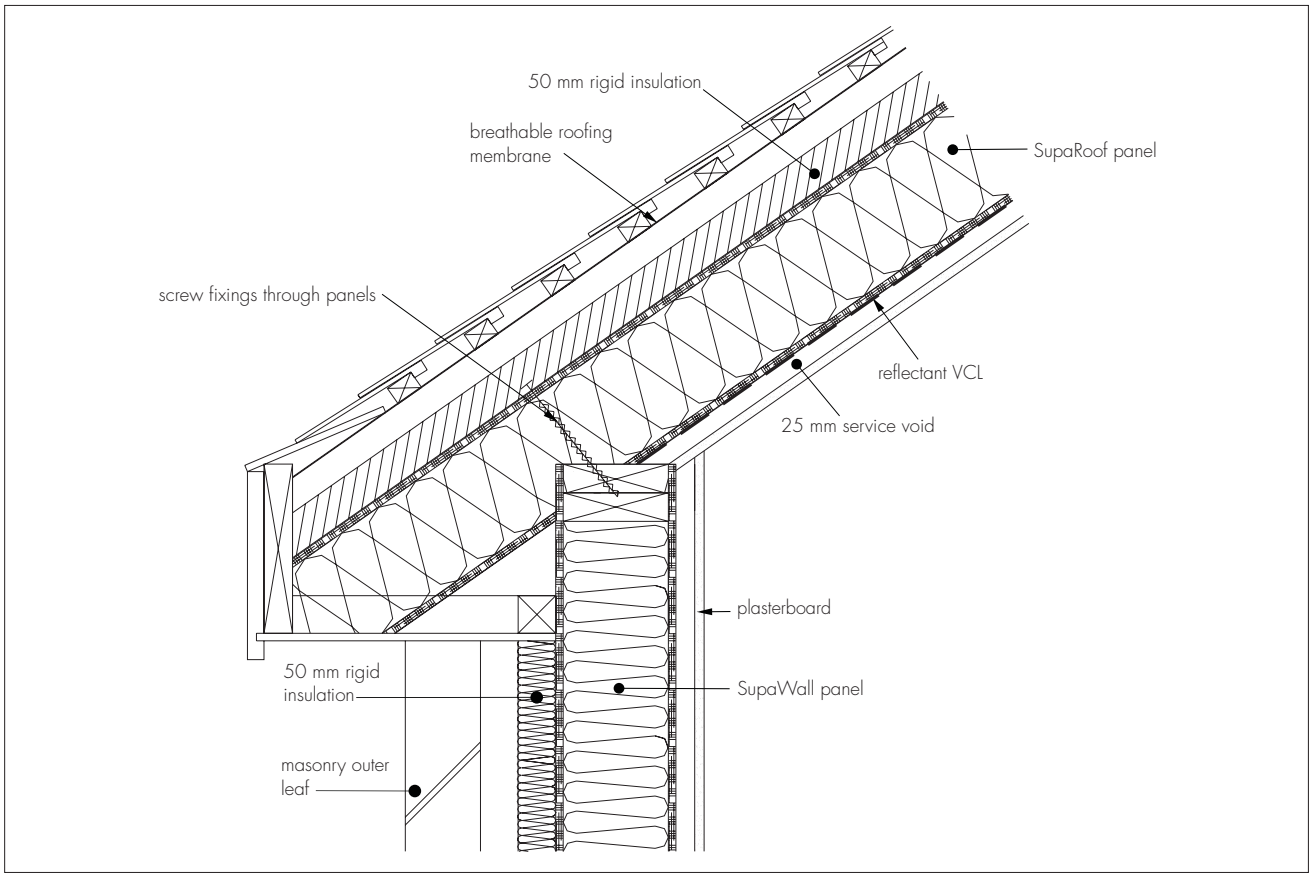
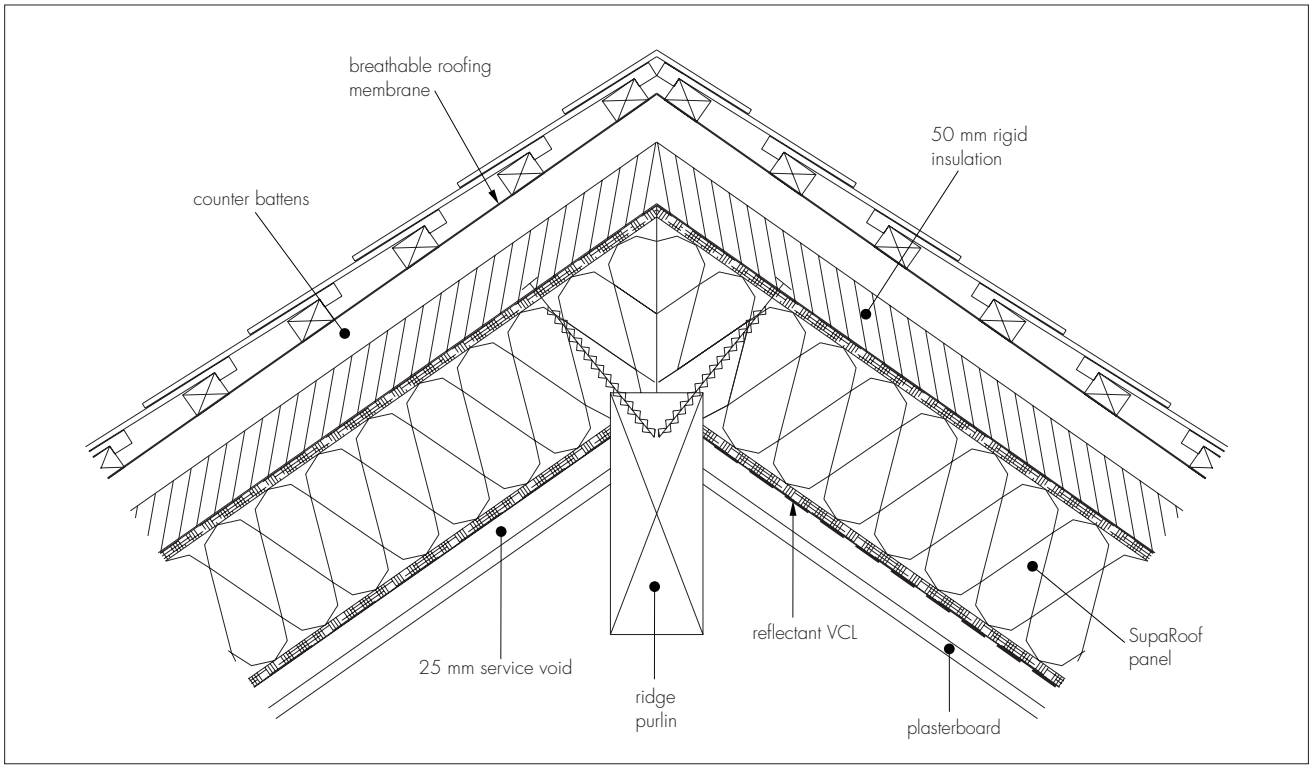


Figure 5 Ridge detail



1.6 Items with specifications defined by the Certificate holder for use with the panels include:

- extruded polyurethane foam sheet to external face, 50 mm thick to one specification
- breather membrane over the OSB/3 or plywood — for walls with a maximum vapour resistance value of 0.6 $MNsg^{-1}$, the membrane should be vapour permeable
- foil-based vapour control layer to one specification
- dry-lining battens — minimum 25 mm by 38 mm kiln dried softwood

- nails of galvanized, sherardized or austenitic stainless steel
- levelling shims and packing — typically plywood for temporary packing followed by durable and non-degradable packing (usually free-flowing, non-shrinkable grout for the full length and width of the sole plate).

1.7 Ancillary items to defined specifications and for use with the panels, but outside the scope of this Certificate, include:

- plasterboard to BS EN 520 : 2004
- cladding to specification suitable for use with the panels, subject to limitations set by the Certificate holder
- damp-proof course — polythene complying with BS 6515 : 1984
- silicone sealant — one-part transparent silicone of density >1020 kgm^{-3}, permissible deformation >25%, UV and fungal resistant
- joist hangers — complying with requirement contained in BS 5268-2 : 2002
- wall ties — Type 5 and Type 6 to BS EN 845-1 : 2003, using BS DD 140-2 : 1987 criteria
- tiling/slate battens — treated softwood to BS 5534 : 2003
- fire stops — mineral wool slab to BS EN 13501-1 : 2002, used as a cavity barrier.

2 Delivery and site handling

2.1 The panels are delivered with polythene protection to each stack (for use in initial transit and temporary protection) and should be stored flat over suitable stillage to a slight fall (to allow rain run-off). Bearers should be at 1500 mm (maximum) centres (end bearers no more than 500 mm from end of panel), and aligned vertically between individual packs in accordance with the Certificate holder's guidelines.

2.2 The panels and all components should be stored at least 150 mm off the ground, covered with polyethylene sheeting or tarpaulin until the panels and components are to be used for site assembly.

2.3 Small individual panels can be lifted by two persons in accordance with current health and safety guidelines; large panels and packs of panels must be lifted by mechanical means using the lifting straps built into and located at the top and bottom of each panel section. Temporary timber blocks should be used where required to protect panel edges during lifting operations.

2.4 The panels can withstand the normal loads associated with site handling and installation. Damaged panels should be assessed and repaired, if appropriate, prior to use.

Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on SupaWall, SupaFloor and SupaRoof Panels.

Design Considerations

3 General

3.1 SupaWall, SupaFloor and SupaRoof Panels, as defined in sections 1.3 to 1.5, are suitable for use as the loadbearing inner leaf of external walls and separating walls; suspended ground and intermediate floors; flat and pitched roofs in dwellings up to four storeys high (including room-in-roof). Wall panels are generally formed in whole or part wall lengths, including openings, subject to lifting, hoisting and transport restrictions.

3.2 Structural calculations for the design of wall, floor and roof panels are carried out in accordance with standard timber-frame industry good practice and should be undertaken by a chartered structural engineer, who should contact the Certificate holder for full design guidance.

3.3 Openings for windows, doors and large service openings are generally formed as part of the factory production process.

3.4 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 built in accordance with BS 5628-3 : 2005. Consideration should also be given to the provision of horizontal movement joints to take account of differential movement.

3.5 When used as floor panels, provision should be made to prevent ground moisture affecting timber floor construction. Typically, this can be achieved by the use of a 50 mm thickness of either concrete or fine aggregate on a polyethylene membrane laid on 50 mm thickness of sand blinding, or 100 mm thickness of concrete.

3.6 A minimum ventilation void of 150 mm should be provided below floor joists. Voids should be ventilated by openings providing not less than 1500 mm^2 per metre run of external wall or 500 mm^2 per m^2 of floor area, whichever gives the greater opening area.

3.7 When used as roof panels, roof tiles and slates should be applied in accordance with BS 5534 : 2003.

3.8 Foundations and floors, made up by other than SupaFloor panels, must be approved for use by the Certificate holder's technical staff and should be suitably level and square to accept the wall panels.

3.9 Where buildings need to comply with *NHBC Standards* or the *Zurich Building Guarantee Technical Manual*, specifiers should observe the requirements of these organisations.

4 Practicability of installation

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

4.2 Any installation work should follow the details and information contained in the construction drawings, as prepared by the Certificate holder or approved designers.

5 Structural performance

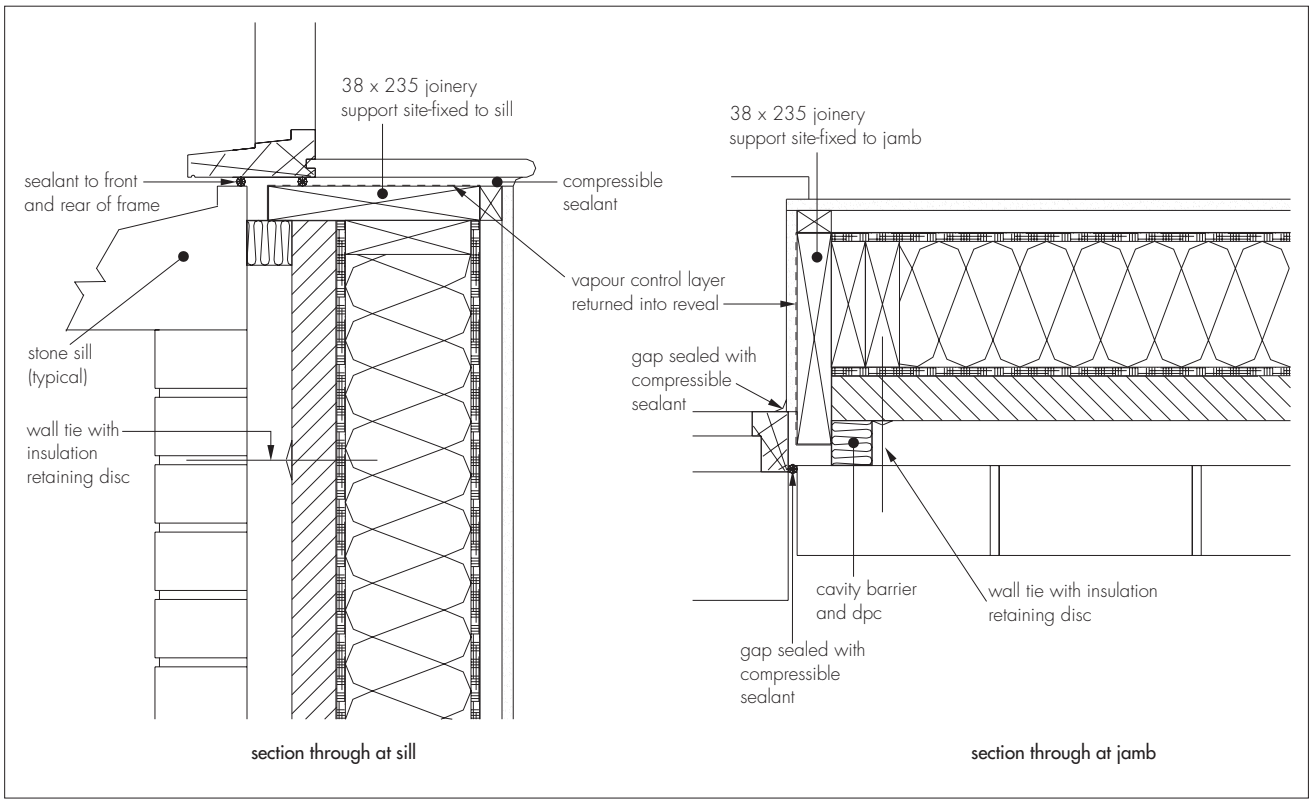
General

5.1 The wall, floor and roof panels will have adequate strength and stiffness when used in accordance with the provisions of this Certificate. Due consideration must also be given to any fire-resistance restrictions (see section 9).

5.2 As the wall panel is a closed panel system, the requirements for extra anchors to the structure through use of holding-down brackets or straps should be considered by the structural engineer at the design stage.

5.3 Lintels and framing around openings form an integral part of the loadbearing wall panels. The sizing of lintels and framing is the responsibility of the structural engineer (see Figure 6).

Figure 6 Typical section through sill and jamb



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

Structural aspects

Wall panels

5.5 Timber-framed wall panels are analysed and designed in accordance with BS 5268-2 : 2002, BS 5268-6.1 : 1996, BS 6399-1 : 1996, BS 6399-2 : 1997 and BS 6399-3 : 1988. In determining the racking resistance, only the OSB/3 or plywood skins are considered; the foam core is ignored. Basic values for racking resistance are obtained from BS 5268-6.1 : 1996, Table 2, modified to suit the criteria of each building design. Generally, panel heights are limited to standard storey dimensions and the ability to transport the panels to site. Maximum loadings must take account of stud dimensions (see section 1.3), bending moments due to eccentricity of load path and allowable lateral deflection due to wind loading.

Floor panels

5.6 Timber-framed floor panels are analysed and designed in accordance with BS 5268-2 : 2002 and BS 6399-1 : 1996. Span limitations are set by maximum loadings and allowable deflections within the timber joist sizes specified in section 1.4.

Roof panels

5.7 Timber-framed roof panels are analysed and designed in accordance with BS 5268-2 : 2002, BS 6399-1 : 1996, BS 6399-2 : 1997 and BS 6399-3 : 1988. Span limitations are set by maximum loadings and allowable deflections within the timber joist sizes specified in section 1.5.

5.8 The strength of all connection details which tie walls to other structural elements (such as walls, floors, roofs) must be evaluated and proved to 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.

5.9 Wall ties to BS EN 845-1 : 2003, Type 5 or 6, and 75 mm diameter insulation retaining discs (typically Sabrefix Extended Wall Tie or Helifix TimTie) are driven directly through the insulation and into the stud.

6 Condensation risk

6.1 Provided the panels are properly assembled as detailed in sections 8.1 to 8.3, the risk of surface and interstitial condensation under normal domestic use will be minimal.

6.2 A condensation risk assessment was conducted in accordance with BS 5250 : 2002 on a typical wall, floor and roof (given in sections 7.5 and 7.6) demonstrating minimal condensation risk under normal conditions of temperature and humidity. Any condensate that may occur will dissipate during the summer months.

6.3 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 *Interstitial condensation and fabric degradation* and BRE report (BR 262 : 2002) *Thermal insulation: avoiding risks.*

7 Thermal performance

7.1 Calculations of thermal transmittance (U value) for a particular construction can be carried out in accordance with the 'combined method' given in BS EN ISO 6946 : 2007 and BRE report (BR 443 : 2002) *Conventions for U-value calculations* and, for a particular floor construction, can be carried out in accordance with BS EN ISO 13370 : 2007. The following thermal conductivities ($Wm^{-1}K^{-1}$) may be used to conduct a 'combined method' calculation:

closed-cell polyurethane insulation core	0.024
OSB/3	0.13
plasterboard	0.25
timber	0.13
closed-cell polyurethane insulation to cavity	0.023

7.2 The overall U value will depend on the construction adopted and the amount of timber used in the construction.

7.3 A wall or floor constructed with the system can meet or satisfy the requirements of the national Building Regulations:

England and Wales — Approved Document L1A, Table 2

Scotland — Mandatory Standard 6.2, clause 6.2.1[1], Table *Maximum U-values for building elements of the insulation envelope*

(1) Technical Handbook (Domestic).

Northern Ireland — Technical Booklet F1, Table 2.2.

7.4 Typical wall[1], roof[2] and floor[3] constructions built with the panels can attain a U value of 0.116 respectively.

(1) The thermal transmittance of the following construction was measured using a guarded hot box: 12.5 mm thick plasterboard on 25 mm by 39 mm timber battens fixed at 600 mm centres, vapour control layer, 9.5 mm thick OSB, 140 mm thick expanded polyurethane foam insulation between 39 mm by 140 mm timber studs fixed at 600 mm centres, 9.5 mm thick OSB, breather membrane, 50 mm thick EPS insulation fixed to the face of the insulation panel.

(2) The thermal transmittance of the following construction was measured using a guarded hot box: 12.5 mm thick plasterboard on 25 mm by 39 mm timber battens fixed at 600 mm centres, vapour control layer, 9.5 mm thick OSB, 140 mm thick expanded polyurethane foam insulation between 39 mm by 140 mm timber studs fixed at 600 mm centres, 9.5 mm thick OSB, breather membrane, 50 mm thick EPS insulation fixed to the face of the insulation panel.

(3) The thermal transmittance of the following construction was calculated in accordance with BS EN ISO 13370 : 2007: 18 mm thick OSB decking, vapour control layer, 38 mm by 140 mm timber joists at 600 mm centres and 140 mm thick injected rigid PUR, 9 mm thick OSB and 50 mm thick closed-cell rigid polyurethane foam and minimum 150 mm cross-ventilated under-floor void.

7.5 Junctions with other elements should be designed to limit heat loss. Detailed guidance in this respect and on limiting heat loss by air infiltration can be found in:

England and Wales — *Limiting thermal bridging and air leakage: Robust construction details for dwellings and similar buildings* TSO 2002 or Accredited Construction Details (version 1.0)

Scotland — Accredited Construction Details (Scotland)

Northern Ireland — Accredited Construction Details (version 1.0).

7.6 For existing buildings that are being extended or converted, walls will be acceptable where they do not exceed the relevant U value given in Table 1 or 2 and junctions and openings comply with BRE report (BR 262 : 2002) *Thermal insulation: avoiding risks,* section 5.5.

Table 1 Typical design U values — England, Wales and Northern Ireland

U value ($Wm^{-2}K^{-1}$)	Construction type
0.25	Mean for floors
0.3	Mean for new extensions[1]
0.35	'notional' mean in SAP and SBEM and limit mean for new-build
0.35	Limit mean for replacement[1], renovation[1] and retained[1] walls
0.70	Individual limit for new-build and flexible approaches[1]

(1) Alternative/flexible approaches are given in the relevant document supporting the national Building Regulations.

Table 2 Typical design U values — Scotland

U value ($Wm^{-2}K^{-1}$)	Construction type
	'notional' mean for dwellings in SAP and the 'simplified' approach:
0.20	— solid fuel packages
0.25	— other fuels, packages
0.25	Mean for floors
0.27	Limit mean for new extensions, conversions[1], alterations and reconstructions
0.30	'notional' mean for non-domestic in SBEM and limit mean for new-build
0.70	Individual limit for new-build and flexible approaches[1]

(1) Alternative/flexible approaches are given in the relevant document supporting the national Building Regulations.

8 Air leakage

8.1 Buildings can achieve adequate resistance to heat loss by air infiltration provided integrity of the vapour control layer is maintained and all laps are effectively sealed. The usual SupaWall male–female panel joining system gives good resistance to air infiltration; further enhancement can be achieved by the use of sealants. Care should be taken to ensure that junctions with other elements and openings comply with the relevant guidance for airtightness given in the relevant documents referred to in section 7.3.

8.2 With correct use of vapour control layers and when the panels are properly joined and sealed, site tests have shown that, typically, the building envelope will achieve an air leakage rate of less than 3 $m^3h^{-1}m^{-2}$ at a pressure difference of 50 Pa in accordance with CIBSE TM 23 : 2000 *Testing buildings for air leakage* site test and BS EN 13829 : 2001. At these levels of air infiltration, consideration should be given to the use of a fully designed and integrated positive ventilation system.

8.3 In England, Wales and Northern Ireland, completed buildings respectively, are subject to pre-completion testing for airtightness in accordance with the requirements of Approved Documents L1A and L2B, section 20B; Technical Booklet F1, sections 2.46 to 2.54; and Technical Booklet F2, sections 2.54 to 2.61.

8.4 Completed dwellings in Scotland are subject to pre-completion airtightness testing if the target air permeability of the proposed building is less than 10 $m^3h^{-1}m^{-2}$, or if the figure is between 10 $m^3h^{-1}m^{-2}$ and 15 $m^3h^{-1}m^{-2}$ and the designer does not wish to use the 15 $m^3h^{-1}m^{-2}$ default figure in the proposed dwelling, in accordance with the Technical Handbook (Domestic).

9 Behaviour in relation to fire

9.1 Fire resistance in the wall panel construction is achieved in a similar manner to that for conventional timber-frame construction. The innermost lining is typically a single layer of gypsum-based board at least 12.5 mm thick for 30 minutes fire resistance (two layers for 60-minute fire resistance). The sheathing on the internal face of the panel (typically OSB or plywood) will provide additional fire resistance to that provided by the plasterboard. Alternative linings and sheathings can be used subject to appropriate assessment.

9.2 When independently tested in accordance with BS 476-21 : 1987, the panel system with a single layer of 12.5 mm thick gypsum-based lining was found to achieve fire resistances of:

- loadbearing capacity 43 minutes
- integrity 42 minutes
- insulation 42 minutes.

9.3 Assessment of the test results and design details demonstrates that the panel system with a single layer of 12.5 mm thick gypsum-based lining exceeds 30-minute fire resistance and, therefore, it follows that greater than

60-minute fire resistance will be achieved using a lining of two layers of 12.5 mm thick gypsum-based board with staggered joints. This provides the performance of:

- external walls 30[1] or 60[2] minutes (from inside)
- separating walls 60[2] minutes (from either side).

(1) 'Short duration' in Scotland.

(2) 'Medium duration' in Scotland.

9.4 The OSB/3 panel linings have a 'high risk'[3] surface spread of flame designation.

(3) Class 3 for the rest of the United Kingdom.

9.5 Constructions incorporating the wall, floor and roof panels must include suitable provision for cavity barriers.

9.6 The panels can form part of a separating wall between dwellings or a wall in accordance with the exceptions permitted by Mandatory Standard 2.2, clause 2.2.7[4], and Mandatory Standard 2.3, clause 2.3.2[4], respectively. Separating walls in Scotland should not include any services.

(4) Technical Handbook (Domestic).

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

9.8 The OSB/3 panel linings have a 'high risk' surface spread of flame designation and, therefore, the maximum vertical or horizontal distance between cavity barriers is 10 metres.

9.9 Where any other form of construction or junctions 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.

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

10 Proximity of flues and appliances

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

England and Wales — Approved Document J

Scotland — Mandatory Standard 3.18

Northern Ireland — Technical Booklet L.

11 Sound insulation

11.1 In England and Wales, separating walls are subject to pre-completion testing in accordance with Approved Document E, Section 1. A similar approach is described in the Scottish Building Standards, Mandatory Standard 5.1, clause 5.1.2[1].

(1) Technical Handbook (Domestic).

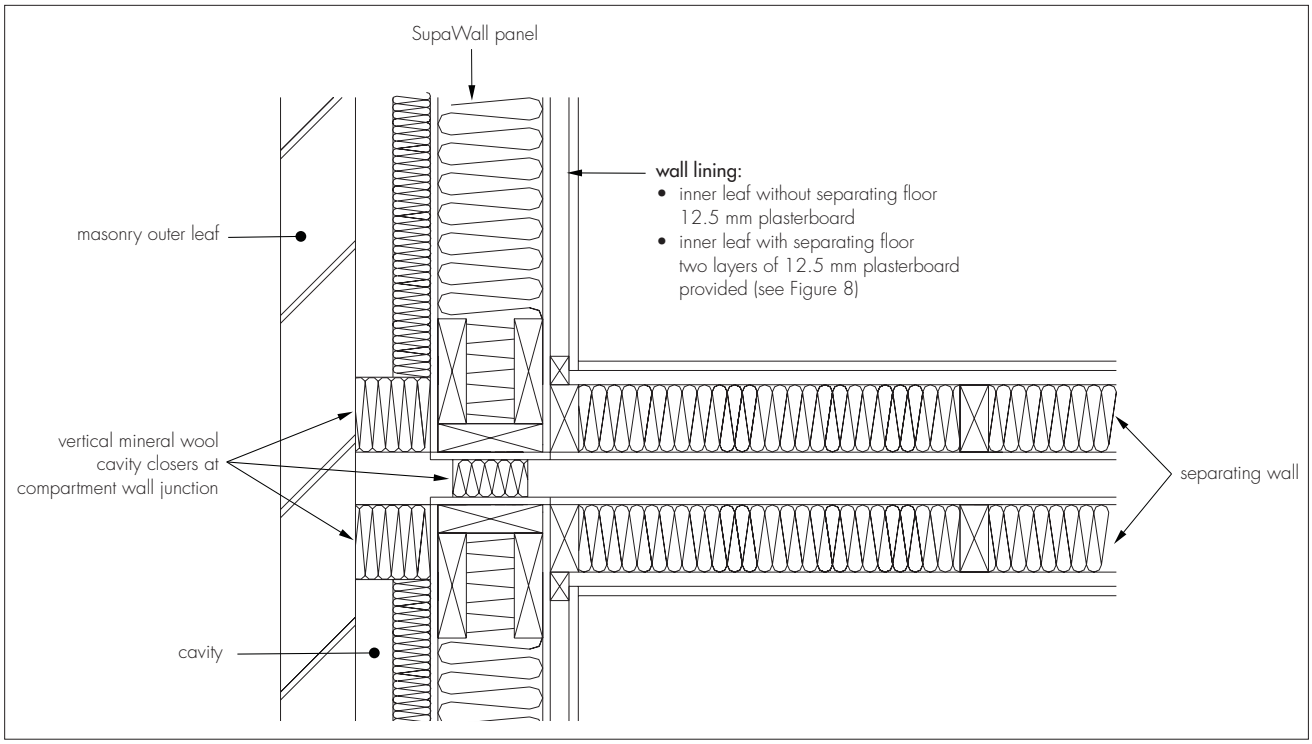
11.2 Good working practice should be adopted for sealing all joints with caulk or tape. Double layers of plasterboard should be staggered. Relevant practices detailed within Robust Details, Part E *Resistance to the passage of sound* should be adopted.

11.3 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.

11.4 A separating wall (see Figure 7) made up as listed below, when subject to field tests to BS EN ISO 140-4 : 1998, achieved an average $D_{nT.w}+C_{tr}$ value of 50. Each leaf consisted of:

- 15 mm thick Soundbloc plasterboard
- 19 mm thick plasterboard planking
- 90 mm timber studs with mineral wool between studs
- 9 mm thick OSB sheathing
- 50 mm wide cavity between leaves.

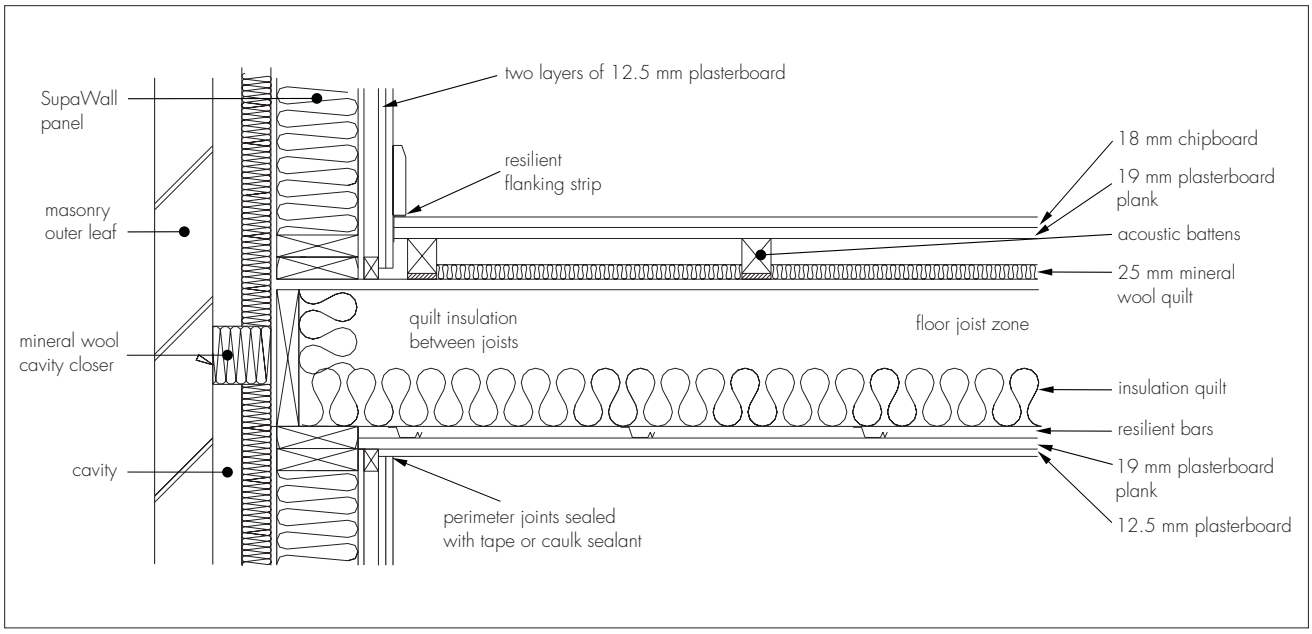
Figure 7 Typical separating wall detail (fire stopping)



11.5 A separating floor (see Figure 8) made up as listed below, when subject to field tests to BS EN ISO 140-4 : 1998, achieved an average $D_{nT.w}+C_{tr}$ value of 45. Floor construction consisted of:

- 18 mm thick chipboard decking
- 19 mm thick plasterboard planking
- 70 mm acoustic battens with mineral wool between battens
- I-joists with 100 mm mineral wool between
- 20 mm resilient bars at 400 mm centres
- 19 mm plasterboard planking
- 12.5 mm Gyproc Fireline plasterboard.

Figure 8 Typical separating floor detail (fire stopping)



12 Damp-proofing and weathertightness

12.1 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, incorporating damp-proof courses and cavity trays. A breather membrane is required with this type of construction.

12.2 When used with other outer leaf construction, cladding or render systems, the final weather resistance of the building is dependent on good design detailing and site practice. The guidance given in BRE report (BR 262 : 2002) 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.

12.3 A breathable membrane layer is required on the exterior side of the exterior sheathing board layer (normally OSB). This is usually sufficient with all types of traditional self-supporting masonry claddings such as stone, brick and render on block. Additional breather membrane[1] protection may be prudent depending on:

- location and degree of exposure to wind-driven rain (guidance given in NHBC Standard 6.1)
- use of lightweight cladding that can allow water penetration, such as rainscreens, timber, brick slip, render on lath, composite boards and tiles/slate
- abutments where additional protection is thought to be required.

(1) This additional breather membrane is to be located with a minimum drainage cavity of 9 mm from the internal face of the rainscreen type cladding. Vertical battens and larger drainage gaps may be required depending on the exact form of the cladding (the advice of Certificate holder should be sought for full design guidance).

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

13 Maintenance and repair

13.1 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 is possible.

13.2 Minor repairs to the system can be carried out to the wall panels prior to erection[1]

(1) The advice of the Certificate holder should be sought for guidance.

13.3 Repairs to panels can also be carried out once erected. All the individual layers of SupaWall, SupaFloor and SupaRoof panels can be replaced selectively within a panel and a panel itself depending on structural implications[1].

(1) The advice of the Certificate holder should be sought for guidance.

14 Durability

14.1 The panels will have comparable durability to that of conventional timber-frame construction, therefore, provided the installation remains weathertight, a life of at least 60 years may be expected.

14.2 Timber used in areas that could be at risk from moisture should be preservative-treated in accordance with the recommendations given in BS 1282 : 1999.

Installation

15 General

15.1 Erection of the SupaWall, SupaFloor and SupaRoof Panels is based on standard timber-frame good practice for closed panel systems and must comply with the details given in the Certificate holder's technical manual and the provisions of this Certificate.

15.2 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 tolerances stated:

- the level of the foundation or other bearing support ±5 mm
- the overall width and length of the building footprint ±10 mm
- the diagonals used for checking the overall squareness of the building: ±5 mm up to 10 metres
  ±10 mm over 10 metres.

15.3 The sole plate is fixed to the foundation using fixings as approved by the Certificate holder and the chartered engineer's requirements. Typically, two 100 mm long masonry nails at 600 mm centres should be used for securing the sole plate into blockwork or brickwork. Additional anchorage, where required by the engineer, can be incorporated using tension ties at centres specified by the engineer.

15.4 Panels are fixed to the sole plates, headbinders and male end studs using steel nails, typically 3 mm diameter by 50 mm long. Nailing is provided typically at 100 mm centres to both OSB faces (see also section 1).

16 Procedure

Ground floor wall panel to foundation construction (solid floor construction)

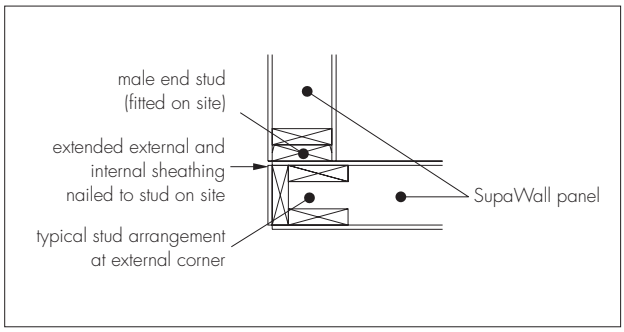
16.1 A dpc is laid on top of the masonry wall or concrete slab.

16.2 A 38 mm deep, chamfered, timber sole plate (see Figure 9) is positioned over the dpc and fixed to the masonry wall or concrete slab using fixings as approved by the Certificate holder and the chartered structural engineer's requirements.

16.3 Sole plates for internal walls are secured using the fixings of the same specification. Sole plates can be adjusted using shims and mortar grouting. The vapour control layer in the wall must be adequately lapped and taped to the damp-proof membrane in the floor to seal against air infiltration.

16.4 Typically starting at one corner, the first panel is lifted off the stack and positioned correctly onto the sole plate, plumbed vertical and securely fixed to the sole plate section using nails at 100 mm centres (see Figure 2). The panel is temporarily braced to maintain stability and the male bevelled joint stud nailed to the corner end (see Figure 9). The next panel is lifted into position on the sole plate and slid sideways until the rebated vertical edge locates over the male stud. The panel is plumbed level and nails, at 100 mm centres, are driven through the OSB sheathing into the male stud. Further panels are lifted into position in a similar manner until the ground floor erection is completed.

Figure 9 Corner joint detail



16.5 Typically, a continuous timber headbinder is fitted into the top rebate of the wall panels following the erection of the ground-floor walls. This is secured either to the panel top rail using two 75 mm long by 3.7 mm diameter nails at maximum 600 mm centres and/or to the OSB sheathing using nails at 100 mm centres as described for the sole plates.

Ground floor construction (SupaFloor panels)

16.6 The panels (see Figure 3) are supported by the foundation masonry and sleeper walls via timber sole plates. Once secured into position, a bevelled sole plate is seated and secured around the floor panel edges to receive the external wall panels as previously described. Sole plates for internal walls are placed in positions to suit the building design, subject to design requirements.

First floor construction

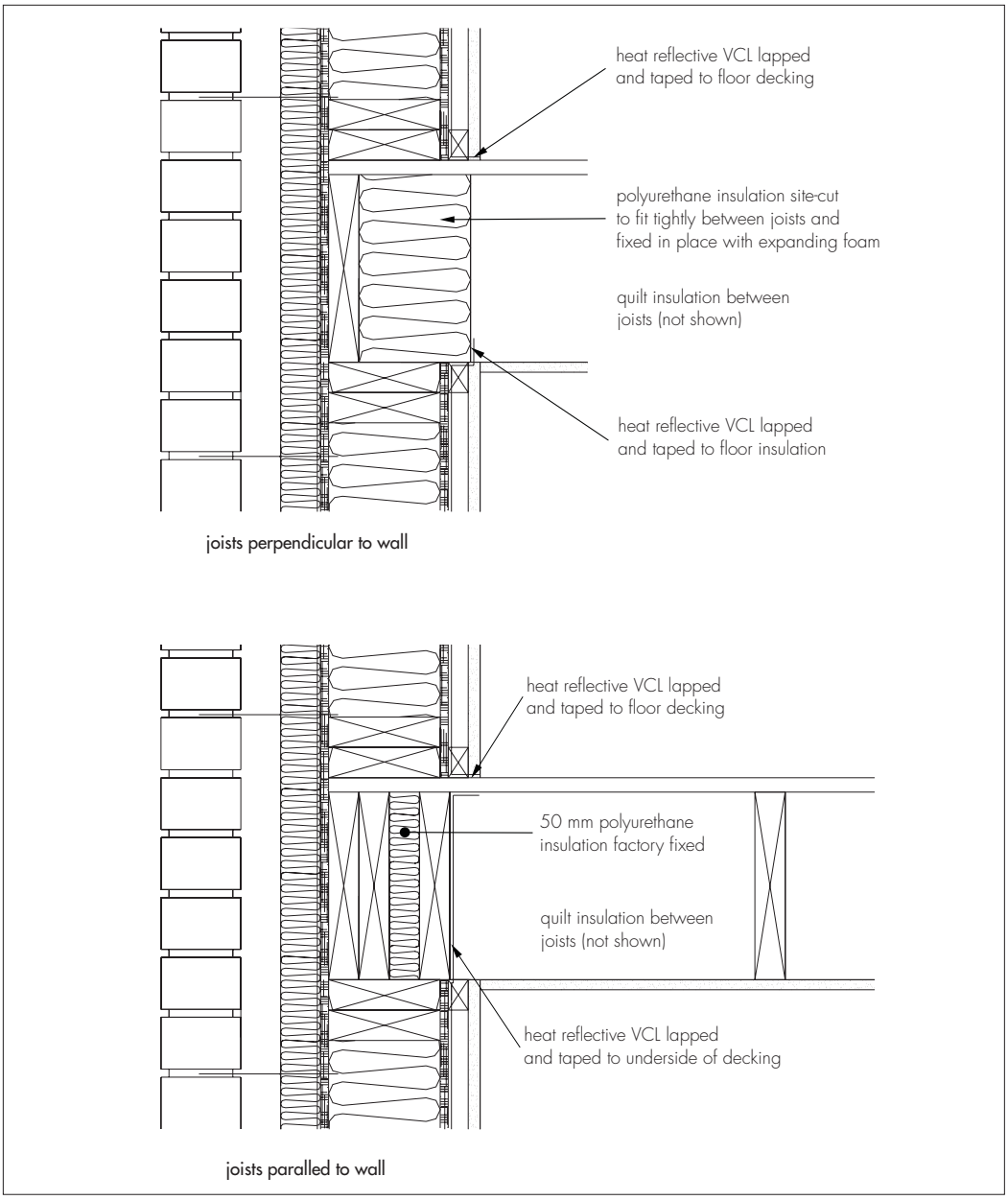
16.7 The SupaFloor panels or other approved floor constructions are lifted into position directly on top of the wall panels and/or ring-beam as appropriate.

16.8 A 38 mm deep chamfered timber sole plate (see Figure 10) is nailed to the floor panel or floor construction. The procedure used for the ground-floor construction is followed.

Roof construction

16.9 The SupaRoof 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 screw fasteners or other appropriate fixings to the engineer's design requirements and as approved by the Certificate holder. Typical ridge and eaves details are shown in Figures 4 and 5.

Figure 10 Typical first-floor junction (panel detail only)



16.10 Traditional roof construction and timber trusses are installed in accordance with the UK Timber Frame Association's recommendations.

16.11 The construction of the roof covering depends on the requirements of each project. A variety of roof finishes can be adopted, subject to Certificate holder's approval. A typical example, using the SupaRoof panels, would be constructed thus (finishes are not covered by this Certificate):

- panels are overlaid with a vapour permeable membrane. Treated softwood counter battens, minimum 38 mm deep by 50 mm wide, are fixed through to the roof panel using stainless-steel screws. Tiling laths and slates or tiles are applied in accordance with the relevant recommendations of BS 5534 : 2003.

17 Investigations

An examination was made of technical data relating to:

- structural properties and design calculations
- airborne sound insulation tests
- thermal performance
- fire test data.

18 Investigations

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

18.2 A visit was made to two sites 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 1282 : 1999 *Wood preservatives — Guidance on choice, use and application*

BS 4978 : 1996 *Specification for visual strength grading of softwood*

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

BS 5268-2 : 2002 *Structural use of timber — Code of practice for permissible stress design, materials and workmanship*
BS 5268-6.1 : 1996 *Structural use of timber — Code of practice for timber frame walls — Dwellings not exceeding four storeys*

BS 5534 : 2003 *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 6399-1 : 1996 *Loading for buildings — Code of practice for dead and imposed loads*
BS 6399-2 : 1997 *Loading for buildings — Code of practice for wind loads*
BS 6399-3 : 1988 *Loading for buildings — Code of practice for imposed roof loads*

BS 6515 : 1984 *Specification for polyethylene damp-proof courses for masonry*

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 519 : 1995 *Structural timber — Grading — Requirements for machine strength graded timber and grading machines*

BS EN 520 : 2004 *Gypsum plasterboards — Definitions, requirements and test methods*

BS EN 636 : 2003 *Plywood— Specifications*

BS EN 845-1 : 2003 *Specification for ancillary components for masonry — Ties, tension straps, hangers and brackets*

BS EN 13501-1 : 2002 *Fire classification of construction products and building elements. Classification using test data from reaction to fire tests*

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 : 2007 *Building components and building elements — Thermal resistance and thermal transmittance — Calculation method*

BS EN ISO 13370 : 2007 *Thermal performance of buildings — Heat transfer via the ground — Calculation methods*

BS EN 13829 : 2001 *Thermal performance of buildings — Determination of air permeability of buildings — Fan pressurization method*

19 Conditions

19.1 This Certificate:

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

19.2 Publications and documents referred to in this Certificate are those that the BBA deems to be relevant at the date of issue or re-issue of this Certificate and include any: Act of Parliament; Statutory Instrument; Directive; Regulation; British, European or International Standard; Code of Practice; manufacturers' instructions; or any other publication or document similar or related to the aforementioned.

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

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

19.4 In granting this Certificate, the BBA is not responsible for:

- 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
- individual installations of the product/system, including the nature, design, methods and workmanship of or related to the installation
- the actual works in which the product/system is installed, used and maintained, including the nature, design, methods and workmanship of such works.

19.5 Any information relating to the manufacture, supply, installation, use and maintenance 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 and maintained. It does not purport in any way to restate the requirements of the Health & Safety at Work etc Act 1974, or of any other statutory, common law or other duty which may exist at the date 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. In granting this Certificate, the BBA does not accept responsibility to any person or body for any loss or damage, including personal injury, arising as a direct or indirect result of the manufacture, supply, installation, use and maintenance of this product/system.

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