Q-MARK REGISTRATION SCHEDULE
FOR
SIPS ECO PANELS LTD.

OSB-STRUCTURAL INSULATED PANELS

Company:	**SIPs Eco Panels Ltd**
Address:	***5 & 6 Boston Road*** ***Viewfield Ind. Est.*** ***Glenrothes*** ***Fife*** **Scotland** **KY6 2RE**
Establishment ID:	**024/2642**

CONTENTS **PAGE**

1 INTRODUCTION 4

2 DEFINITIONS & ABBREVIATIONS 4

3 SCOPE 5
3.1 Product Description 5
3.2 Intended Use 6
3.3 Product Range 6

4 BUILDING REGULATIONS 7

5 SCHEME REQUIREMENTS 7
5.1 Quality Management System (QMS) 7
5.2 Documentation 7
5.2.1 Manufacturing Documentation 7
5.3 Minimum QMS requirements 8
5.3.1 Factory Production Control 8
5.3.2 Management Responsibility 8
5.3.3 Company representative 8
5.3.4 Internal audits 8
5.3.5 Documentation 8
5.3.6 Work Instructions 8
5.3.7 Procedures for non-conforming product 8
5.3.8 Traceability 8
5.3.9 Training 8
5.3.10 Complaints 9
5.3.11 Document control 9
5.3.12 Machinery maintenance and calibration 9
5.4 Other requirements of the Scheme 9
5.4.1 Product Specification/Range Documentation and Assessment 9
5.4.2 Packaging Transport and storage instructions 9
5.4.3 Installation 9
5.4.4 Durability and Serviceability 10

6 TEST AND VERIFICATION REQUIREMENTS 10
6.1 Test reports and sampling 10
6.2 Initial Type Testing 10
6.2.1 Mechanical Resistance and Stability 10
6.2.2 Safety in case of fire 10
6.2.3 Hygiene, Health and Environment 11
6.2.4 Safety in use 11
6.2.5 Protection against noise 11
6.2.6 Energy economy and heat retention 11
6.3 Aspects of durability 12
6.4 Audit testing 12

7 IDENTIFICATION AND USE OF THE BM TRADA AND Q-MARK LOGOS 12

8 GUARANTEES 12

ANNEX 1 MATERIALS, DIMENSIONS AND TOLERANCES 13
A1.1 Wood based outer skin material 13
A1.2 Core material 13
A1.3 Adhesives 14
A1.4 Manufactured Panel 15

A1.5 Ancillary Components 15

ANNEX 2 MECHANICAL RESISTANCE 16
A2.1 General 16
A2.2 Strength 16
A2.2.1 Axial and bending loads 18
A2.2.2 Racking resistance 19
A2.3 Stiffness 19
A2.3.1 Creep deflections 19
A2.3.2 Instantaneous deflection 20
A2.3.3 Deflection limits 21

APPENDIX 1 NORMATIVE DOCUMENTS 22

1 INTRODUCTION

The Q-Mark Engineered Wood Product Scheme is a third-party product certification scheme operated by BM TRADA Certification Ltd.

The scheme is based on the principles of ISO9001, EN 45011/12, ISO Guide 62/65 and confirms compliance with the principles of BS5268 Part 2 2002 together with a specific set of performance criteria set by TRADA,(as defined in Clause 4 of this document) in order to attain a design which performs to a high standard. The relevant standards listed above are to be read in conjunction with this document.

The scheme covers factory production control, documentation and test/assessment evidence, and the resultant certification is specific to clearly defined products and their constituent components.

The objectives of the scheme are:

- To improve the quality and performance of Engineered Wood Products.
- To provide unambiguous evidence of compliance with the standards.
- To provide manufacturers with a clear route toward CE marking.
- To provide specifiers, regulators and inspection authorities with the appropriate information for them to identify suitable products.

2 DEFINITIONS & ABBREVIATIONS

The following definitions and abbreviations are used throughout the document. Other definitions are as given in the relevant standards.

Assessment	A considered judgement to determine whether products meet the criteria laid down in the relevant technical specifications.
Audit	Visit by BM TRADA or other certification body to examine the quality management system and production processes of a manufacturer or supplier, usually to determine appropriate compliance to ISO 9001, with specific emphasis on the factory production control elements.
Member	Company holding membership of the Q-Mark scheme.
QMS	Quality Management System (e.g. one meeting BS EN ISO 9001).
Schedule	The certification schedule, which identifies the scope and range of products covered by the membership certificate.
Scheme	The BM TRADA Q-Mark Engineered Wood Products Scheme.

3 SCOPE

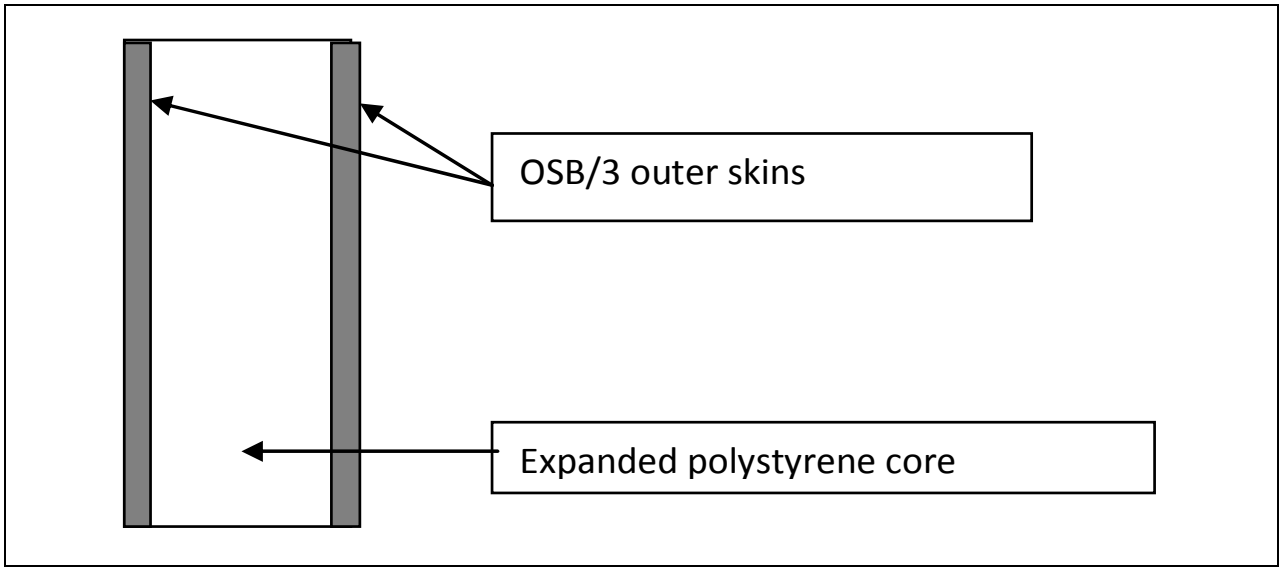
The Scheme is applicable to Engineered Wood Products which fall within the scopes of the product standards referenced in clause 1 of this document, and applies to new products as manufactured and supplied, and before being installed into the works. The following range of products has been assessed under this certificate.

3.1 Product Description

Sips eco panels are a type of Structural Insulated Panel (SIP) that is produced by SIPs Eco Panels Ltd. The Panels are high performance, high quality structural panel components that enhance the insulation properties of a structure. They are suitable for inner leaf structural walls, internal load bearing walls and curtain walls.

The Sips eco panel is an engineered composite load-carrying panel product comprising of relatively thin Oriented Strand Board Type 3 (OSB/3) as an outer skin, separated by a relatively thick core of expanded polystyrene (EPS) material.

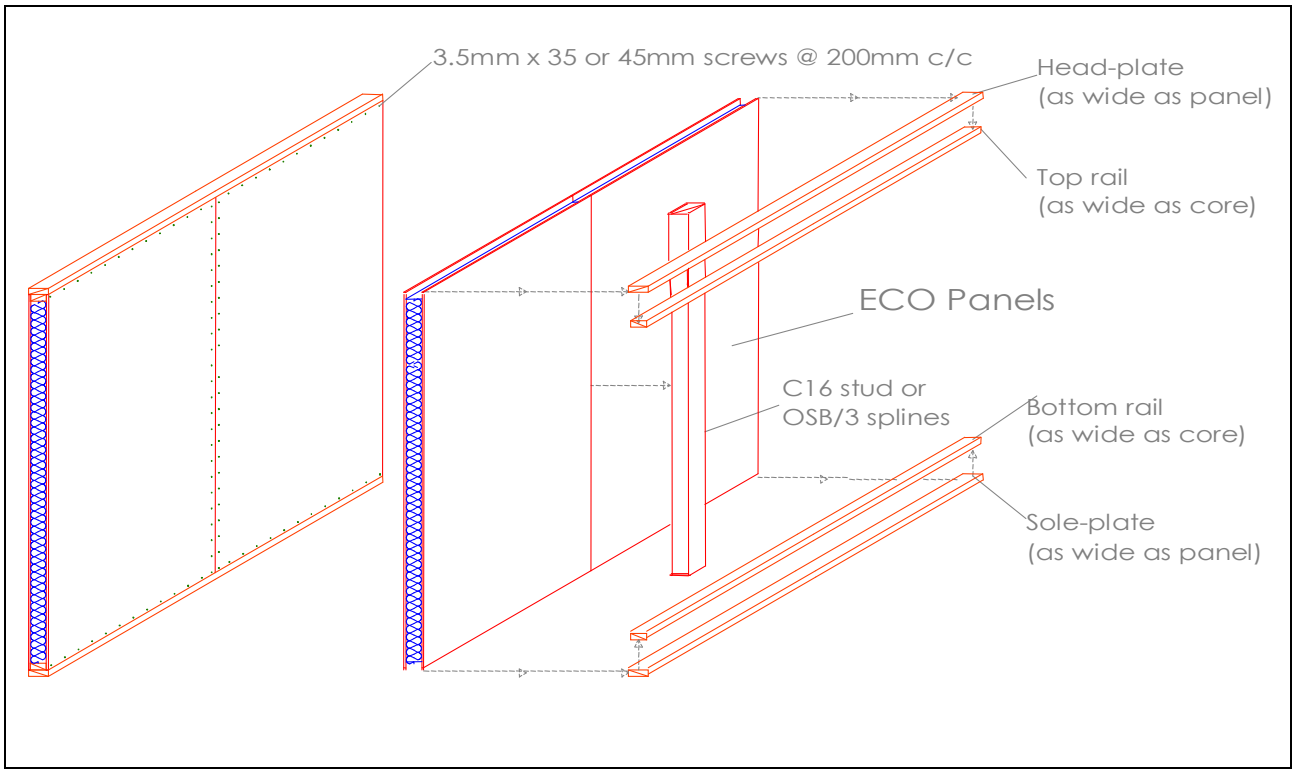
Figure 1 Sips eco panel layers



Sips eco panels are connected together to form larger rigid sections and three-dimensional forms. The panels are connected together using OSB or solid wood splines with expanding Polyurethane sealant used at each and every junction.

SIPs Eco Panels Ltd. acknowledges that SIP products are complex structural and material forms that require recognised third party testing and quality controlled manufacturing processes.

Figure 2 Sips eco panel construction



3.2 Intended Use

Under the scope of this certification,

- Sips eco panels are intended for use as load-bearing walls of building constructions, with a minimum working life of 60 years.
- Sips eco panels may be used as in-fill panels where only horizontal loads are to be taken.
- Constructions are limited to 2/3 storeys depending on expected dead and live loads.
- Sips eco panels are suitable for dwelling house applications as outlined in approved document B volume 1, tables A1 and A2, with the exception of situations requiring more than 30 minutes fire resistance.
- Sips eco panels are suitable for non-dwelling house applications as outlined in Approved document B Volume 2 tables A1 and A2.

TRADA has assessed standard Details and has found that based on previous knowledge and experience, Sips eco panels are capable of complying with minimum performance requirements of Building Regulations. Airborne sound insulation tests between rooms with typical wall constructions have been carried out in accordance with BS EN ISO 140-4 to verify this.

3.3 Product Range

The products covered by this certificate have two nominal overall thicknesses; these are 119 and 169 mm. They comprise of two OSB skins, each with a thickness of 11mm, and an expanded polystyrene core of EPS 70 with a thickness of 97 or 147 mm. Panel weights are up to 200 kg. The maximum installed height of a panel is 4800 mm.

Sips eco panels are manufactured in widths of 1200 or 2400 mm and lengths of 2400 or 4800 mm long. The panels are supplied in the appropriate shapes and sizes for each project, together with any sealant, fixings and jointing pieces required. For each project, an inventory of components is manufactured from working drawings generated by SIPs Eco Panels Ltd. in accordance with the client's approved design. Annex 1 gives more specifications for panel sizes and fixings.

4 BUILDING REGULATIONS

Sips eco panels are certified under the BM TRADA Q-Mark Engineered Wood Products scheme. This certification relates to the panels alone and does not extend to the construction as a whole into which they are incorporated. It is the opinion of BM TRADA that if used in accordance with the requirements of this scheme and in accordance with the SIPs Eco Panels Ltd. installation manual, then the panels will satisfy, or contribute to satisfying the relevant requirements of the following Regulations:

- The Building Regulations 2000 Amended (England and Wales)
- The Building (Scotland) Regulations 2004
- The Building Regulations (Northern Ireland) 2000.

5 SCHEME REQUIREMENTS

BM TRADA has determined that the Member conforms with the requirements within these clauses by auditing and/or other forms of verification where appropriate.

5.1 Quality Management System (QMS)

The manufacture of the products has been conducted under the control of an appropriate QMS.

The QMS shall be subject to periodic audit (not less than once per year).

All new Members are subject to an initial inspection.

5.2 Documentation

The following documents are controlled under the requirements of this scheme:

- Manufacturing documentation (e.g. Quality Manual, procedures)
- Product specification/range documentation and Assessment
- Installation instructions
- Test reports and Sampling
- Q-Mark certificate and schedule(s)

5.2.1 Manufacturing Documentation

The Member has supplied details of his manufacturing documentation to BM TRADA for review. Typically, this will comprise of the Quality Manual, procedures, works instructions and test data.

5.3 Minimum QMS requirements

5.3.1 Factory Production Control

As part of the documented process control procedures the company has:

Demonstrated that the product is being fabricated in accordance with documented manufacturing procedures from purchase of raw material to the production of the finished product.

These procedures control all critical aspects of the production.

Target limits are defined at each one of these areas.

All performance characteristics claimed are controlled in order to remain consistent by including appropriate checks or testing in the QMS to ensure a consistent and similar product is produced.

5.3.2 Management Responsibility

The management of the company carries out regular reviews of the system, which shall include production records and any complaints that have been received. Notes are kept of any topics discussed and decisions made.

5.3.3 Company representative

A member of the management team is responsible for the QMS.

5.3.4 Internal audits

Routine internal audits are carried out to ensure compliance with the requirements of BS 5268-2 are met.

5.3.5 Documentation

Inspection and test records are kept in a format that is acceptable to BM TRADA Certification but no less than 3 years.

5.3.6 Work Instructions

Work instructions and target values are placed at the critical production points throughout the manufacturing process.

5.3.7 Procedures for non-conforming product

Where factory production control/target values are out of specification there is a procedure for identifying and correcting these deficiencies. The factory production control system has been assessed and can detect non-conforming product quickly, so that affected product can be quarantined.

5.3.8 Traceability

There are procedures to enable appropriate traceability of production runs through to dispatch.

5.3.9 Training

The company maintains records to show that staff have been satisfactorily trained to undertake the manufacturing and inspection tasks that they have been assigned. Records are kept of this training and the personnel's job description shall be clearly defined.

5.3.10 Complaints

The company maintains a register of all complaints received on the quality of their product, which should show the steps they have taken to deal with the problem and their analysis of the causes. These records shall be kept for a minimum of 5 years.

5.3.11 Document control

There are procedures in place for effectively controlling the quality of documentation issued to the relevant personnel, so that they have up-to-date procedures.

5.3.12 Machinery maintenance and calibration

All machinery and measuring/testing equipment that could affect the quality of the product is properly maintained and calibrated so that a consistent product can be produced and tested. There is a maintenance and calibration schedule. A record of the maintenance and calibration carried out is kept.

5.4 Other requirements of the Scheme

5.4.1 Product Specification/Range Documentation and Assessment

The Member has supplied details of his product specification as part of this certification. Should the range of products change, then amendments will be reviewed by BM TRADA.

5.4.2 Packaging Transport and storage instructions

This must be carried out in accordance with the manufacturer's instructions and the following requirements of this scheme.

During transportation the Sips eco panels shall be protected from adverse weather by covering completely with polythene material provided.

On site the panels should be stacked horizontally on a flat level surface and stored out of ground contact. Measures must be employed to minimize changes in moisture content caused by the weather, by storing completely under waterproof material and stacked so as to encourage water run off. Bearers and stickers should be employed under and within the stack at no more than 600mm centres for full panels or equally spaced over the length with a minimum of 5 bearers. Bearers should be no more than 150mm from the edge of the panels.

Damaged panels must not be used.

5.4.3 Installation

Erection of the Sips eco panels must comply with the details given in SIPs Eco Panels Ltd.' "Erection manual for Structural Insulated Panels" and the provisions of this certificate.

The main contractor must ensure that the accuracy of the foundation is in accordance with SIPs Eco Panels Ltd.' instructions, in particular the following must be within the tolerance of +/- 5mm:

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

The strength of all connection details and components that tie the Sips eco panels to all other structural elements must be selected to ensure adequate vertical and horizontal load paths within the structure.

The specification and design of these items must be determined by the building engineer responsible for the stability of the building. Guidance on the design of connection details must be sought from SIPs Eco Panels Ltd.

In general Sips eco panels do not incorporate lintels. Spanning over openings is achieved through the use of rim beams at floor or roof level. The sizing and bearing of the spanning rim beam shall be determined in the design process.

In structures where Sips eco panels are used in conjunction with typical platform timber frame panels, particular care should be taken to avoid differential movement between the Sips eco panels and the timber frame panels.

5.4.4 Durability and Serviceability

Sips eco panels achieve durability through appropriate design, detailing and construction. Designers should implement proven and reliable timber frame 'Durability by Design' construction details. As long as these requirements are met then Sips eco panels will have comparable durability to that of OSB/3 to BS EN 300 i.e. at least 60 years.

Timber to be used in areas that could be at risk e.g. sole plates should be preservative treated in accordance with the recommendations given in BS 1282.

As regards serviceability, the Sips eco panels have sufficient stiffness to avoid unacceptable bowing, deflections and vibrations arising from normal use (see Annex 2).

6 TEST AND VERIFICATION REQUIREMENTS

6.1 Test reports and sampling

BM TRADA has assessed the results of any testing and sampling, and/or calculation that has been carried out in accordance with the scheme rules.

6.2 Initial Type Testing

6.2.1 Mechanical Resistance and Stability

Sips eco panels will have adequate strength and stiffness when designed in accordance with BS 5268-2 using the design data given in Annex 2.

For racking resistance the characteristic structural properties in Annex 2 are derived from tests to BS 5268 part 6.1. Creep and duration of load are also characterised in Annex 2. Permissible design values to be used when evaluating the design resistance of Sips eco panels are given in Annex 2.

6.2.2 Safety in case of fire

The Q-Mark certification refers to the engineered wood product and not the structure in to which it is installed. Sips eco panels as products in their own right have not been classified as regards reaction to fire class. However the OSB facings may be classified D-s2, d0 based on the OSB and timber of density greater than 400kg/m3 in accordance with Table 8 of EN13986.

Submitted fire test data for a panel 2400 × 2900 × 119mm with a vertical load of 2.28 kN/m run and an exposed single layer of 12.5mm Gyproc wallboard achieved 30 minutes fire resistance when tested in accordance with BS 476 Part 21 1987. The fire resistance of the product when assembled in a structure is to be provided by appropriate products and detailing as given in the manufacturer's instructions.

6.2.3 Hygiene, Health and Environment

Sips eco panels contain styrene which is listed as a regulated VOC as defined in the EU database. Based on the declaration of the manufacturer EPS 70 meets the requirements of EN 13163 and does not contain CFC, HCFC or HFA and so have zero ozone depletion potential. The Oriented Strand Board (OSB) used in the SIP panels has a classification E1 according to EN 13986 as measured according to EN 120.

The Sips eco panel is a component in a building and requires other building products to make up the full construction. For normal domestic situations when used in conjunction with appropriate wall construction there is no risk of condensation determined in accordance with BS 5250, provided that panels are correctly jointed and sealed together, and that a vented cavity is provided on the cold face of the wall. Appropriate, controlled internal ventilation must be installed in accordance with Approved Documents as per clause 4.

6.2.4 Safety in use

Not relevant.

6.2.5 Protection against noise

Standard Details of separating walls have been assessed and based on previous knowledge and experience, TRADA have found Sips eco panels capable of complying with minimum performance requirements of Building Regulations. Airborne sound insulation tests between rooms with typical wall constructions have also been carried out in accordance with BS EN ISO 140-4 to verify this.

6.2.6 Energy economy and heat retention

The calculated values for thermal resistance (the U value) for Sips eco panels are 0.367 W/m²K for 119 mm thick panels and 0.248 W/m²K for 169 mm thick panels.

The current legislation requires a thermal resistance value of 0.35 W/m²K in England and 0.30 W/m²K in Scotland. *Table 1* below gives an example of how Sips eco panels can be used in a typical wall construction to achieve this value.

Table 1 Example of construction layers for thermal resistance calculations

Panel Type	Layer Description	Layer Thickness	U value*
11mm OSB skins with 97mm EPS core	External Roughcast Blockwork (6.6% mortar) Airspace / battens (10.4% timber) Sips eco panels Airspace / battens (10.4% timber) Plasterboard	20mm 100mm 60mm 119mm 25mm 12mm	0.26 W/m^{2}K

**Calculations to BS EN ISO 6946*

6.3 Aspects of durability

The use of Sips eco panels is limited to service classes 1 and 2 as defined in BS 5268-2. Under these conditions it is reasonable to predict a minimum durability of 60 years. No structural verification has been carried out by BM TRADA for service class 3.

6.4 Audit testing

An ongoing audit test program has been agreed with the company. This focuses on the density and strength characteristics of the expanded polystyrene insulation core as detailed in the factory production control manual.

7 IDENTIFICATION AND USE OF THE BM TRADA AND Q-MARK LOGOS

Correct identification of approved Engineered Wood Products, is vital in order that purchasers and controlling authorities clearly understand the status of products presented to them. It is therefore a requirement that all products or at least the packaging of the products, covered under the scheme are identified as “BM TRADA Q-Mark Approved” or other similar wording, and/or display the Q-Mark badges. This will assist subsequent inspection authorities to recognise acceptable products. For similar reasons, Members are encouraged to make use of the Marks on marketing and technical documentation.

8 GUARANTEES

The scheme makes no requirement on its Members to give a minimum guarantee. This is entirely up to the discretion of the Member.

ANNEX 1 MATERIALS, DIMENSIONS AND TOLERANCES

A1.1 Wood based outer skin material

The outer skin is made of orientated strand board OSB/3 in accordance with EN 300 and EN 12369-1, The OSB is glued to the core in the panel manufacturing process.

The properties of the OSB panels adopted in this assessment are presented in the tables below.

Table 2 OSB nominal dimensions from supplier

Designation	Width	Length	Thickness	Maximum difference on diagonals
OSB/3 to EN 300	2400 ± 3 mm	4800 ± 3 mm	11 ± 1 mm	3 mm

Table 3 OSB/3 material properties according to EN 12369-1

Properties	Notation	Values
Mean MOE (tension)	$E_{t,mean,0}$	3800 N/mm^2
Mean MOE (compression)	$E_{c,mean,0}$	3800 N/mm^2
Mean panel shear modulus	$G_{v,mean}$	1080 N/mm^2
Characteristic panel shear strength	$f_{v,k}$	6.8 N/mm^2
Characteristic tension strength	$f_{t,0,k}$	9.4 N/mm^2
Characteristic compression strength	$f_{c,0,k}$	15.4 N/mm^2
Density	ρ	550 kg/m^3
Characteristic flexural strength	$f_{m,o,k}$	16.4 N/mm^2

Note that when a Sips eco panel is subjected to a bending moment the OSB/3 skins are loaded either in tension or compression, by virtue of their position at the outer faces of the panel, rather than in bending.

A1.2 Core material

The core is an expanded polystyrene insulation product (EPS 70) that is supplied by S and B EPS Ltd. It is manufactured to EN 13163:2001 and has a BBA approval, certificate No. 02/3943.

The EPS is supplied in the form of block (ex mould and trimmed) cut sheet or to specific cut shapes/pieces derived from S and B EPS manufactured block. The blocks are self-coloured tending to a white appearance generally and are CFC, HCFC and HFA free, the agents not being used in any stage of the product manufacture.

The EPS core is sandwiched in one piece between the OSB skins. The Sips eco panels is manufactured with a 45 mm groove along each side by sizing the EPS core 90 mm smaller than the OSB skins.

The core has the following dimensional tolerances according to SIPs Eco Panels Ltd. procurement schedule. These values are more rigorous than those declared in BBA certificate No. 02/3943.

Table 4 EPS block dimensional tolerances from supplier

Dimension	Value
Length	+0 mm, -6 mm
Width	+0 mm, -3 mm
Thickness	±1 mm
Maximum difference on diagonals	2 mm

The core has the following material properties according to EN 13163:2001 and BBA approval, certificate No. 02/3943, as required for the EPS 70 classification.

Table 5 Selected declared EPS 70 material properties

Property	EN 13163 designation	Value
Compressive strength at 10% deformation	CS(10)70	0.07 N/mm^2
Bending Strength	BS115	≥0.115 N/mm^2
Compressive creep at 0.25 σ_c	CC(1.5/1/10)70	See note below
Thermal conductivity	$\lambda_{90/90}$	0.038 W/(mK)
Dimensional stability at 23℃ 50% RH	DS(N)2	±0.2%

Note: CC(1.5/1/10)70 means that under a declared stress σ_c of 0.07 N/mm^2, total thickness reduction is 1.5% or less and compressive creep is 1% or less when extrapolated to 10 years duration.

The nominal density of S & B EPS 70 is 16 kg/m³.

Table 6 Additional EPS properties

Property	Values
Mean modulus of rigidity $G_{c,mean}$	0.248 N/mm^2
Deformation factor for permanent loads (creep) $k_{def\ eps}$	3.0
Characteristic density of core ρ_k	15 kg/m^3

A1.3 Adhesives

One of three adhesives may be employed.

- Leeson D3225 polyurethane adhesive
- Rohm and Haas MOR-AD M600 urethane adhesive
- Apollo A9264RD polyurethane adhesive

The adhesives are applied by roller coating to the EPS. The coating thickness is 100 microns to 200 microns. Application and processes are covered by specific instructions.

The quality of the bond is by tension tests perpendicular to the plane of the board. Failure must occur in the core, not the bond.

A1.4 Manufactured Panel

The Sips eco panel is assembled by bonding outer skins of OSB to a core of EPS. In a tensile test perpendicular to the plane of the board, the bond strength should exceed the strength of the EPS. The internal bond strength of the EPS in the panel is not less than 80 kPa (0.08 N/mm²).

The tolerance on the width and length of the finished Sips eco panels is +0 mm, -2 mm.

The Sips eco panel is assembled so that, in service, the strands of the OSB/3 skins are oriented parallel to the direction of the vertical load.

A1.5 Ancillary Components

The product will be fixed at the top and base with solid timber members. These are referred to as head-plate, sole-plate, top rail and bottom rail. The panels are joined to each other with a solid timber spline or a pair of OSB splines

Typically the solid wood will be planed-all-round (PAR) softwood, graded in accordance with EN 14081 to strength class C16 or higher. The head-plate and sole-plate components must be evaluated in the design process to ensure that they provide sufficient bearing strength.

Apart from the head-plate and sole-plate, the ancillary components are sized to fit in 45mm deep grooves at the edges of the Sips eco panels. The grooves are the same width as the thickness of the core, so that the ancillary components can fixed to the OSB skins. The width of the head-plate and sole-plate matches the full thickness of the panel.

Table 7 Ancillary timbers: dimensional tolerances from supplier

Length	Width	Thickness
Greater than required by Purchase Order	+0 mm, -2 mm	+0 mm, -2 mm

Table 8 Characteristic properties of ancillary materials – C16 timber

Property	Notation	Values
Characteristic flat wise bending strength	$f_{m,k}$	16 N/mm^2
MOE perpendicular to grain – mean	$E_{90,mean}$	2700 N/mm^2
Density – mean	ρ_{mean}	370 kg/m^3
Characteristic compression strength perpendicular to grain	$f_{c,90,k}$	2.2 N/mm^2
Factor taking into account load configuration, possibility of splitting and degree of compressive deformation	$k_{c,90}$	1.0

ANNEX 2 MECHANICAL RESISTANCE

A2.1 General

Sips eco panels are suitable for use as load bearing partitions, separating walls and the inner leaf of external walls in buildings. The panels may also be used as in-fill panels.

The panels are not suitable for use in Service Class 3 conditions as defined in BS 5268-2:2002.

The scope of this certificate is limited to wall panels only, not a complete building system. Internal and separating floors, which form an integral part of a wall, together with roofs, masonry cladding and foundations are outside the scope of this certificate.

The strength of all the connection details that tie walls to other structural elements (such as walls, floors, roofs, solid timber or OSB splines) must be evaluated to determine that they provide adequate stability for the overall building design. The specification and design for these items must be determined by the Structural Engineer responsible for the stability of the building. Guidance on the design of connection detail may be obtained from the Certificate holder.

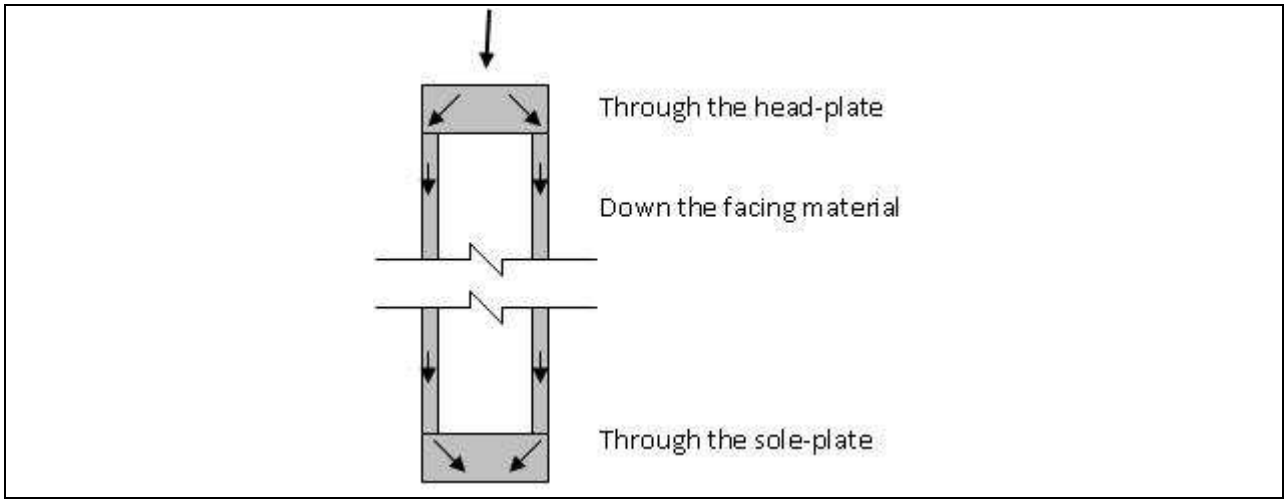
The panels can be shown to have adequate strength and stiffness when designed in accordance with the methods stated in this certificate. A Structural Engineer familiar with the design and application of the Sips eco panel system should carry out all designs. Either the certificate holder or one of their appointed agents according to the standard details for the system should carry out all production drawings.

A2.2 Strength

Vertical loads through a Sips eco panel travel principally through the facing material. It is the designer's responsibility to ensure that the head and sole-plate have sufficient bearing capacity under the facing material's footprint. This check is particularly important when considering point loads (see *Figure 3*).

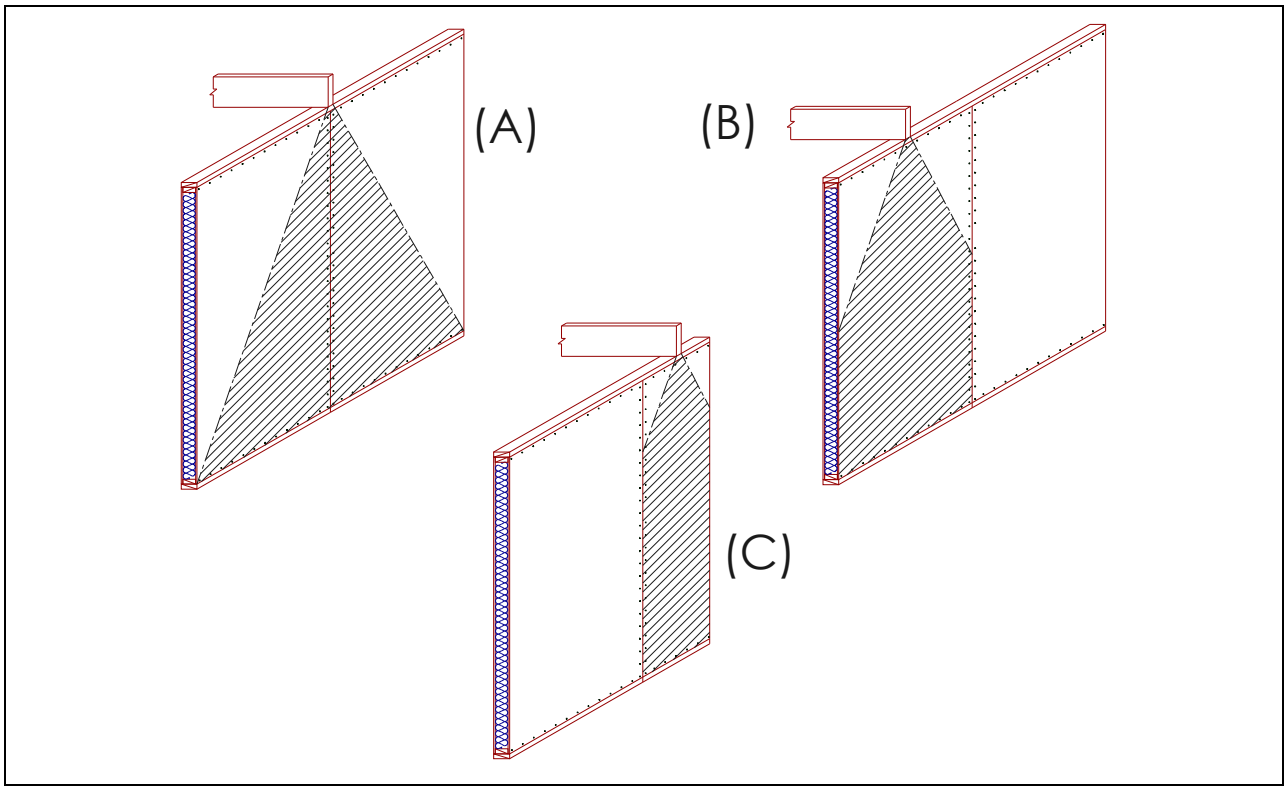
Optionally the structural designer may incorporate a structural member, such as a timber stud, into the Sips eco panel to transfer point loads.

Figure 3 Load path through the Sips eco panel



Individual joists and beams can create point loads on the edge of the Sips eco panel. The transfer of these loads through the panel must be considered.

Figure 4 Point-load load paths



Panels must be checked for the total load on a specific panel segment (i.e. line-load + point-load). The head-plate must be checked against compression perpendicular to the grain.

A. Point load occurs over panel junction. Load is assumed to spread at 45 degrees into both panels. Head-plate should be continuous over joint.

B. Point load occurs away from a junction. Load is assumed to spread at 45 degrees into the panel below. It is assumed that no load can be transferred through the spline.

C. Point load occurs over a narrow panel (i.e. <1220mm). Load is assumed to spread at 45 degrees into the panel below. It is assumed that no load can be transferred through the spline. Narrow panels constitute critical locations.

Where axial loads are transferred through the panel as shown in Figure 3 Load path through the Sips eco panel

, the depth of the head-plate should satisfy the following criterion

$$d_{\text{head plate}} \geq \frac{3}{2}\left(\frac{F_{\text{d}}}{28.3} - b_{\text{joist}}\right)$$

Where:

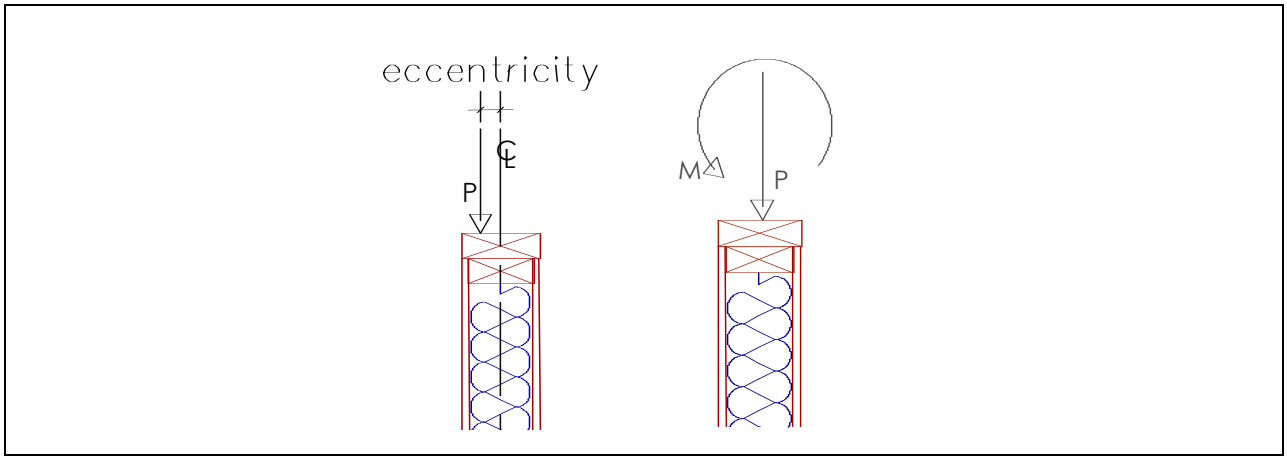
$d_{\text{head-plate}}$ = the depth of the head-plate in mm
F_{d} = The design load on the bearing area in Newtons
b_{joist} = the breadth of the joist or beam in mm

If a rim-beam is present point loads will be spread over a considerable length. Panels would need to be checked for total loads (line-loads + point loads), hence the loading situations in *Figure 4* may be ignored.

A2.2.1 Axial and bending loads

Sips eco panels should be assessed with regard to concentric vertical load, eccentric vertical load and wind loads (see *Figure 5*).

Figure 5 *Eccentric loading on the Sips eco Panel*



The designer should include in the calculations the self-weight of the panel.

All of the above must be checked by a structural engineer.

Table 9 below gives permissible transverse loads calculated in accordance with BS 5268-2 for medium term loading. The effect of the combined vertical and transverse loads is calculated using the interaction formula in BS 5268-2.

Table 9 *Permissible transverse loads for roof or wall panels (kN/m²)*

Maximum Vertical Load (kN/m)	Panel Height (m)	Panels with both skins in service class 1 (e.g. internal walls)		Panels with one skin in service class 2 (e.g. external walls)	
		119mm thick Sips eco panel	169mm thick Sips eco panel	119mm thick Sips eco panel	169mm thick Sips eco panel
12	2.4	2.287	3.472	2.043	3.097
	3.6	0.988	1.634	0.883	1.498
	4.8	0.417	0.892	0.372	0.797
24	2.4	1.465	2.279	1.063	1.670
	3.6	0.714	1.151	0.552	0.907
	4.8	0.392	0.652	0.304	0.520
36	2.4	0.753	1.265	0.280	0.561
	3.6	0.388	0.703	0.170	0.377
	4.8	0.195	0.390	0.072	0.204
48	2.4	0.150	0.430	NP	NP
	3.6	0.082	0.289	NP	NP
	4.8	0.005	0.138	NP	NP

Notes
NP = Not permitted under the scope of this certification
The maximum vertical load is the long term compressive load in kN per metre width of panel.
The transverse load is the permissible medium term load per unit area. It is assumed to be distributed uniformly over the whole panel.

A2.2.2 Racking resistance

To determine the racking resistance of a wall section the principles of BS 5268-6.1 are to be followed, except for the following modifications:
The basic racking resistance R_b to be used for either panel thickness with zero vertical load and no openings is 2.5 kN per metre run.

The modification factors K_{104}, K_{105} and K_{108} may be used to modify the basic racking resistance value

The racking resistance must be reduced for sections of wall containing openings as follows:

$$R._b = 2.5\exp(-0.0365x)$$

Where:

R_b = test racking resistance per metre run of the wall in kN/m
x = percentage opening in a panel 2.4m in length

The minimum distance between the edge of the opening and the nearest edge of the panel is 0.25 m. The percentage opening should not exceed 35%.

Only full height wall sections are to be included in the calculations.

For vertical loads greater than zero and less than 10.4 kN per metre run the basic racking resistance is to be modified with the following expression for K_{107} derived from tests.

$$K_{107} = 0.004F^2 + 0.025F + 1$$

Where:

F = the vertical load per metre run in kN/m

A2.3 Stiffness

Two types of forces induce bending deflections into a Sips eco panels, these are wind loads and eccentrically applied loads from the floor deck. Eccentrically applied loads are modelled to act as a concentrated moment applied at one support of a simply supported beam.

The serviceability checks to be carried out by the designer are as follows.

A2.3.1 Creep deflections

$$\delta_{creep} = (M^{e}{}_{dead} + 0.3M^{e}{}_{imposed})\left[\frac{l^2}{9\sqrt{3}E_{s,perm}I_S} + \frac{3}{5G_{c,perm}A_v}\right]$$

Where:

δ_{creep} = creep deflection at mid-span due to eccentric quasi-permanent loads
L = the height of the panel,
$E_{s,perm}$ = mean MoE of OSB/3 skin in tension modified by service class for long term loading
I_s = moment of inertia for the OSB/3 skin
$M^{e}{}_{dead}$ = moment induced by the eccentric dead load (per metre wall length)
$M^{e}{}_{imposed}$ = moment induced by the eccentric imposed load (per metre wall length)

$G_{c,perm}$ = shear stiffness of EPS core $G_{c\ mean}/(1+k_{def\ eps})$
A_v = shear area – the cross section of the core and half the cross section of each skin

Table 10 Values for E_sI_s for long term loading (Nmm²)

Panel thickness	Inner skin	Outer skin	E_sI_s
119 mm	SC1	SC1	9.785 × 10¹⁰ Nmm²
		SC2	8.749 × 10¹⁰ Nmm²
169 mm		SC1	2.090 × 10¹¹ Nmm²
		SC2	1.815 × 10¹¹ Nmm²

Notes
SC1 = Service Class 1
SC2 = Service Class 2

A2.3.2 Instantaneous deflection

$$\delta_{inst} = w_w\left[\frac{5l^4}{384E_sI_s}+\frac{l^2}{8G_cA_s}\right]+(M^e{}_{dead}+M^e{}_{imposed})\left[\frac{l^2}{9\sqrt{3}E_sI_s}+\frac{3}{5G_cA_v}\right]$$

Where:

δ_{inst} = the instantaneous deflection at mid-span
w_w = the net wind pressure (per metre wall length)
L = the height of the panel,
E_s = Mean MoE of OSB/3 skins in tension modified by service class for short term or medium term loading
I_s = Moment of inertia for the OSB/3 skin
$M^e{}_{dead}$ = the moment induced by the eccentric dead load (per metre wall length)
$M^e{}_{imposed}$ = the moment induced by the eccentric imposed load (per metre wall length)
$G_{c,mean}$ = Shear stiffness of EPS core
A_v = Shear area – the cross section of the core and half the cross section of each skin

Table 11 Values for E_sI_s for short term loading (Nmm²) for SC1 or SC2

Panel thickness	E_sI_s
119 mm	2.446 × 10¹¹ Nmm²
169 mm	5.226 × 10¹¹ Nmm²

Table 12 Values for E_sI_s for medium term loading (Nmm²)

Panel thickness	Inner skin	Outer skin	E_sI_s
119 mm	SC1	SC1	2.005 × 10¹¹ Nmm²
		SC2	1.786 × 10¹¹ Nmm²
169 mm		SC1	4.284 × 10¹¹ Nmm²
		SC2	3.822 × 10¹¹ Nmm²

Notes
SC1 = Service Class 1
SC2 = Service Class 2

A2.3.3 Deflection limits

The deflection limits shown in *Table 13* constitute the maximum calculated deflections taken from BS 5268.

Table 13 Maximum deflections

Deflection Type		Limit
Lateral deflections caused by wind	δ_{inst}	Lesser of $L/222$ or 13.5mm
Deflections caused by eccentric loads + wind	$\delta_{creep} + \delta_{inst}$	$L/250$
Creep caused by eccentric loads	δ_{creep}	$L/1000$
Long term (including creep)	δ_{final}	$L/333$

Note: L is the height of the panel

APPENDIX 1 NORMATIVE DOCUMENTS

BS 5268 Part 2: 2002	Structural use of timber — Part 2: Code of practice for permissible stress design, materials and workmanship. Amended December 2007.
BS 5268 Part 6.1: 2002	Structural use of timber — Part 6: Code of practice for timber frame walls — Section 6.1 Dwellings not exceeding seven storeys. Amended November 2007
EN 1995:2004	Eurocode 5, Design of timber structures.
BS EN ISO 17025:2005	General requirements for the competence of testing and calibration laboratories.
BS EN 1990:2002	Eurocode 5 - Basis of structural design.
BS EN 12369-1:2001	Wood based panels – Characteristic values for structural design. Part 1: OSB, particleboards and fibreboards.
BS EN 300:1997	Oriented Strand Boards (OSB). Definitions, classification and specifications.
BS EN 45011:1998	General requirements for bodies operating product certification systems.
BS EN 45012:1998	General requirements for bodies operating assessment and certification/registration of quality systems.
ISO 9001:2000	Quality management systems. Requirements.
BS 1282:1999	Wood Preservatives. Guidance on choice, use and application.
BS EN 13986:2004	Wood based panels for use in construction – Characteristics, evaluation of conformity and marking.
BS EN ISO 140-3:1995	Acoustics. Measurement of sound insulation in buildings and of building elements. Laboratory measurements of airborne sound insulation of building elements.
BS EN ISO 6946:1997	Building components and building elements. Thermal resistance and thermal transmittance. Calculation method.
EN 14081-1:2005	Timber Structures. Strength graded structural timber with rectangular cross section. Pt 1 General requirements.
BS 5250:2002	Code of practice for control of condensation in buildings.
Report: AK/SIPs/CH/Feb2010-1	Edinburgh Napier University report - OSB-Structural Insulated Panel Systems – A report prepared on behalf of CUSTOM HOMES Boston Road, Viewfield Ind. Est., Glenrothes, Fife KY6 2RE.
Report Number BTC 11883F	The Building Test Centre report – A FIRE RESISTANCE TEST ON A LOADBEARING EQUAL STRUCTURAL PANEL WALL CONDUCTED IN ACCORDANCE WITH BS 476: PART 21: 1987: CLAUSE 8.
Report: HHACY/10695/02R/JB	H&H Acoustic Consultancy Division report – Pump House, Cromwell Hill, Maldon, Essex, CM9 4QD, Airborne Sound Insulation, Separating Walls