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Technical Specifications

Contents

1 FIRE RATINGS

1.1 GUIDELINES FOR FIRE RATINGS AUSTRALIA

Internal walls:

– /60/60 and 30/30/30

BOTH SIDES

• 1 x 13mm GYPROCK FYRCHEK plasterboard.

Or

SIDE ONE

• 1 x 10mm GYPROCK Plasterboard CD.

• 1 x 13mm GYPROCK FYRCHEK plasterboard.

SIDE TWO

• 1 x 13mm GYPROCK FYRCHEK plasterboard.

External Walls:

60/60/60 (from outside only)

• External cladding of 1 x 7.5mm CSR Cemintel Texture Base Sheet.

• 1 x 13mm GYPROCK FYRCHEK MR Plasterboard.

• Timber Batten at 600mm maximum centres.

• Breather membrane.

• SIPS

Internal wall side

•1 x 10mm GYPROCKK Plasterboard CD.

60/60/60 (both sides)

• External cladding of 1 x 7.5mm CSR Cemintel Texture Base Sheet.

• 1 x 13mm GYPROCK FYRCHEK MR Plasterboard.

• Timber Batten at 600mm maximum centres.

• Breather membrane.

• SIPS

Internal wall side

• 1 x 16mm GYPROCK FYRCHEK plasterboard

60/60/60 & 90/90/90

External cladding of 1 x 7.5mm CSR Cemintel Texture Base Sheet.

• 1 x 16mm GYPROCK FYRCHEK MR Plasterboard.

• Timber battens at 600mm maximum centres.

• Breather membrane.

• SIPS

• Lining material

INTERNAL WALL SIDE

• 2 x 13mm GYPROCK FYRCHEK plasterboard.

2 ACOUSTIC RATINGS

This table is intended to describe the decibel (dB) loss of sound through the SIPS Industries SIP wall. The wall in question is a SIPS Industries SIP with two layers of 16mm plasterboard attached to one side. The opposite side has one layer of 16mm plasterboard attached as a resilient channel using self tapping screws. The transmission loss data is as follows for "Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.":

Frequency (Hz)	Transmission Loss (dB)	Frequency (Hz)	Transmission Loss (dB)
125	31	800	61
160	31	1000	66
200	36	1250	69
250	39	1600	71
315	42	2000	68
400	45	2500	67
500	51	3150	70
630	56	4000	71

This table is intended to describe the decibel (dB) loss of sound through the SIPS Industries SIP wall. The wall in question is a SIPS Industries SIP with one layer 13mm plasterboard attached to one side. The transmission loss data is as follows for "Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions."

The transmission loss data is as follows:

Frequency (Hz)	Transmission Loss (dB)	Frequency (Hz)	Transmission Loss (dB)
125	31	800	49
160	33	1000	52
200	25	1250	55
250	22	1600	53
315	16	2000	54
400	24	2500	51
500	37	3150	52
630	45	4000	56

This table is intended to describe the decibel (dB) loss of sound through the SIPS Industries SIP wall. The wall in question is a SIPS Industries SIP with one layer 16mm plasterboard attached to one side on a resilient channel using self tapping Screws. The transmission loss data is as follows for "Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions."

Frequency (Hz)	Transmission Loss (dB)	Frequency (Hz)	Transmission Loss (dB)
125	25	800	56
160	24	1000	59
200	21	1250	63
250	28	1600	58
315	32	2000	60
400	31	2500	56
500	43	3150	54
630	55	4000	53

This table is intended to describe the decibel (dB) loss of sound through the SIPS Industries SIP wall. The wall in question is a SIPS Industries SIP with two layers of 16mm plasterboard attached to either side. The transmission loss data is as follows for "Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions."

Frequency (Hz)	Transmission Loss (dB)	Frequency (Hz)	Transmission Loss (dB)
125	33	800	43
160	27	1000	48
200	28	1250	52
250	27	1600	58
315	26	2000	56
400	29	2500	56
500	36	3150	60
630	41	4000	65

3 THERMAL RATINGS

Element type: Wall - Structural Insulated Panel 112mm

Layer		Material name	Thickness	R value
Air film resistance				0.04
	1	SIP - OSB	11	0.13
	2	SIP - Insulation	90	2.3
	3	SIP - OSB	11	0.13
Air film resistance				0.12
			TOTAL R Value	**2.72**

Element type: Wall - Structural Insulated Panel 142mm

Layer		Material name	Thickness	R value
Air film resistance				0.04
	1	SIP - OSB	11	0.13
	2	SIP - Insulation	120	3.13
	3	SIP - OSB	11	0.13
Air film resistance				0.12
			TOTAL R Value	**3.55**

Element type: Wall - Structural Insulated Panel 162mm

Layer		Material name	Thickness	R value
Air film resistance				0.04
	1	SIP - OSB	11	0.13
	2	SIP - Insulation	140	3.58
	3	SIP - OSB	11	0.13
Air film resistance				0.12
			TOTAL R Value	**4.00**

4 COMPOSITE MATERIALS

4.1 ORIENTED STRAND BOARD (OSB/3)

- Debarked coniferous wood from controlled forestry operations
- Paraffin wax emulsion
- PU resin
- Water
- No off gases

4.2 GLUE

- Water based PVA with a cross-linker GLX4
- No off gases

4.3 EPS

- 98% air
- Inert
- Non toxic, non irritant and rot proof
- Treated with flame retardant

5 BUILDING PAPERS

5.1 WALL PAPER/MEMBRANE

Wrap High Perm (HP) is a spun bonded polypropylene material developed primarily as a breather membrane for use in timber frame wall construction. Proctor Wrap HP affords effective protection for the life of the building against rain, snow and dust. Proctor Wrap HP is a highly durable, strong and lightweight textile membrane that is silent when exposed to wind and will last the lifetime of the building even in corrosive coastal environments.

Unlike foil products, the high water vapour permeability of Proctor Wrap HP allows for the controlled escape of water vapour from within the building whilst restricting the ingress of moisture. Proctor Wrap HP will help protect the building fabric and insulation from condensation and related problems such as mould, timber rot, corrosion and loss of thermal resistance.

Physical Properties	**Test Method**	**Result**
Nominal Weight		100 g/m2
Nominal Thickness		0.5 mm
Tensile Strength: along the roll across the roll	AS1301.448	 4.0 kN/m 2.7 kN/m
Nail Tear Resistance along the roll across the roll	MOAT No: 27 : 5.4.1	 115 N 126 N
Burst Strength	AS2001.2.19	305 N
Water Vapour Resistance	ASTM E96	0.13 MNs/g
Moisture Vapour Permeability	BS 3177 / ASTM E96	2600g/m2/24hr
Fire Resistance to Spread	BSEN13501.1:2000	Class E
Flammability Index	AS1530.2	1 (low)
Resistance to water	AS 4201.4	High/Pass
Available roll dimensions		1.5m x 50m

5.2 ROOF SHIELD PAPER

Roofshield is a three layer laminate designed to combine water hold out properties with high breathability. The central layer is a fine-fibred melt blown material which differs from other breather membranes on the market. This unique central layer provides a fibrous structure which allows for a much higher breathability than other laminates which may include films. These small fibres give increased water hold out over spunbond single layer products and afford a number of advantages.

Physical Properties	**Test Method**	**Result**
Nominal Weight		175 g/m2
Nominal Thickness		0.6 mm
Tensile Strength: 56 days aged @ 60oC along the roll across the roll	BS 2782:320A	6.37 kN/m 4.60 kN/m
Nail Tear Resistance along the roll across the roll	MOAT No: 27 : 5.4.1	 156 N 131 N
Burst Strength, wet/dry	BS 3137	488 kN/m2
Water Vapour Resistance	BS 3177	0.09 MNs/g
Moisture Vapour Permeability	BS 3177	2409 g/m2/day
Resistance to Water Penetration (Eosin Test)	BS 4016	Pass
Air Permeability	EDANA 140.2-99	70 l/m2/s
Fire Resistance to Spread of Flame	DIN 4102	B2
Head of Water	BSEN20811	1135mm
Available roll dimensions		1.5m x 50m

6 SIPS SCREWS

The SIPS screws are a specialized, flat head fastener engineered for a wide range of panel applications including Structural Insulated Panels, and can be used in wood, corrugated and structural steel substrates.

Coating

OMG CR-10 corrosion resistant coating exhibits less than 15% red rust after 30 Kesternich cycles. R-10 coating exceeds F.M. Approval Standard 4470.

Technical

Selected SIP screws allow for the recommended penetration or embedment and take into account the total build up dimension of the Insulated Panel. The tread length of each screw is 70mm

Recommended minimum fastener penetration:

Steel decking or purlins 0.7 to 1.6mm thick	-	15mm through
Plywood decking, 18mm minimum thickness	-	12mm through
Timber decking 25mm minimum thickness	-	12mm through
Timber Joists	-	35mm embedment

Tensile, Shear Strength and Pull Out Values(Pull Out Values based on recommended penetration above)

Tensile & Shear Strength

FASTENER	DIAMETER (MM)	TENSILE STRENGTH (kN)	SHEAR STRENGTH (kN)
SIP DST	6.3	16.8	15.0

Pull Out Values (kN) – Steel

FASTENER	DIAMETER (MM)	STEEL THICKNESS (MM)	0.7	0.9	1.2	1.6
SIP DST	6.3		1.6	2.2	2.7	4.0

Pull Out Values (kN) – Timber

FASTENER	DIAMETER (MM)	SOFTWOOD PURLIN/RAIL	25MM SOFTWOOD BOARDING	18MM OSB	18MM PLYWOOD
SIP DST	6.3	4.1	3.5	2.2	2.2

1kN = 1000 Newton Force 10N = 1Kgf

All values shown are typical test results and do not include safety factors and should be taken as a guide for design purposes only

7 EXTERNAL CLADDING OPTIONS

There are many different types of cladding available on the market and many new ideas on product application. Below is a list of cladding options.

7.1 TIMBER

No other cladding material can offer the design freedom, ease of handling, range of products and natural beauty of timber. Timber clad buildings can be designed to suit any environment, the possibilities are almost limitless. They can look traditional, modern or simply unique-designed to suit the style, flair and imagination of the owner. Whatever the climate, a timber clad wall can be designed to give excellent thermal performance all year round. Its natural sound dampening properties also help keep noise out of buildings and reduce reflected noise in confined outdoor spaces. Modern finishes give a long lasting and attractive appearance to timber cladding and can be used to change the colour and style of a timber clad building. It is also quick and easy to keep pace with changing fashions. The natural resilience of timber gives a built-in flexibility.

Suppliers include Weathertex and Carter Holt Harvey.

7.2 FIBRE CEMENT SHEETS

Fibre cement sheets are a good option for a base to render to. They are resistant to water damage and will not rot. It is specifically designed for use in the lining of walls in kitchens, bathrooms, laundries, toilets and other areas commonly known as 'wet areas' in domestic buildings. Generally, it is recommended that all Wallboard sheets be applied horizontally, wallboards have a recess on both long edges so that sheets may be taped and set with jointing materials. This type of product helps resist stresses and strains caused by wind and weather.

Rendering over the cement boards is the least resistant to damage and is vulnerable to hard hits. It's durable for approximately 25 years but needs to have holes patched immediately to last this long.

Suppliers include CSR and James Hardie.

7.3 STEEL

External steel cladding for your home is available in a range of colours and plain or textured finishes. The steel sheet product has a specially baked coating to reduce maintenance and avoid fading. Steel sheets have been especially designed to withstand Australian weather conditions and to render a high degree of resistance to corrosion offering a long lasting exterior facade. Metal can be expensive depending where you are, however it is the cheapest to install.

Suppliers include Colourbond, Zincalume, Stratco, Bluescope Steel.

7.4 BLOCK

By their very nature concrete blocks are very low maintenance and can be used as a base for a render finish. The colourings used in the blocks are natural Oxides and never need painting. Maintenance of concrete block walls is basically limited to just hosing them down with the garden hose if they look dusty. Brick walls have a poor R value and their high thermal mass makes them cold in winter, and often too hot in summer.

Suppliers include Midland, Boral and Australbrick.

7.5 BRICKS

When choosing bricks for your external cladding, go the extra mile and choose a quality brick that the manufacturer can guarantee will look the same in twenty years' time. A high quality brick with a well manufactured face will look good in the future. A cheaper brick may well 'shed' its exterior sand colour, and end up unattractive. Brick walls have a poor R value and their high thermal mass makes them cold in winter, and often too hot in summer.

Suppliers include Midland, Boral and Australbrick.

8 STRUCTURAL CERTIFICATION

Our Ref: WS091278
Enquiries to: Rick Hoad

VDM CONSULTING

23rd September 2009

SIP's Industries Australia Pty Ltd
C/- Habitat International
8 / 27 Hood Street
SUBIACO WA 6008

Attention: Jan Zuideveld

Dear Jan,

RE: STRUCTURAL INSULATED PANELS, SIP'S
BUILDING CODE OF AUSTRALIA VOLUME 2
STRUCTURAL CERTIFICATION

This certificate relates to Structural Insulated Panels (SIP'S) produced by SIP'S Australia at their West Australian plant in Bibra Lake. The panels are to be used for load bearing and non load bearing walls and for roof/es in Class 1 & 10 buildings.

Further, this certificate relates only to SIP's produced from the following materials;

- 90mm and 140mm thick expanded polystyrene core
- 11mm Orientated Strand Board (OSB) supplied by Egger in Germany

Each SIP whether using 90mm polystyrene or 140mm polystyrene cores are faced on both sides with 11mm OSB pressed and glued to the polystyrene.

VDM Consulting is of the opinion that the SIP's Australia Structural Insulated Panels comply with the structural performance requirements of the BCA, specifically the relevant sections of Clause P2.1 Structure.

This statement forms part of a technical appraisal prepared by Milestone Building Compliance to confirm evidence of suitability pursuant to Clause 1.2.2 (a) (iii) as there is no Australian or International Standard or acceptable construction manual in the Building Code of Australia relating to this form of composite panel. The international Eurocode 5 (BS EN 1995-1-1 : 2004) can be applied to the design of the OSB material. VDM Consulting have relied on international literature relating to the composite panel that has been used extensively in Europe and North America for several decades.

VDM Consulting have been able to complete calculations using first principle engineering methods to model the structural characteristics of the panels and these results have compared favourably to

recommended panel loadings given in international literature, such as that published on the website of the Structural Insulated Panel Association (SIPA).

VDM Consulting has organised and witnessed a testing program of these panels at the University of Western Australia and the test results obtained have confirmed a reasonable level of conformity with both engineering calculations and international recommended load tables.

Based on these investigations and tests, VDM Consulting certifies that;

1. The SIP's Australia Structural Insulated Panels are capable of supporting lateral loads such as wind and earthquake in accordance with AS/NZS 1170.0/2002, AS/NZS 1170.2/2002 and AS/NZS 1170.4/2007.

2. The SIP's Australia panels are capable of supporting permanent, imposed and other actions in accordance with AS/NZS 1170.1/2002 and snow and ice actions in accordance with AS1170.3/2003.

3. The SIP's Australia panels could be designed as lintel beams and shear walls if designed and detailed in accordance with Australian Codes and Eurocode 5. Connections involving the OSB material should be designed in accordance with Eurocode 5.

4. VDM Consulting have reviewed the attached Load Design Charts and Standard Construction details and confirm they can be applied to the SIP's Australia Panels. Note that we have followed current international practices of permissable stress design for these composite panels, where it is generally accepted that "permissable working loads" are one third of the ultimate failure loads. Connection details should be designed in accordance with Australian codes and Eurocode 5.

These statements assume that the structures involving SIP's Australia panels will be independently designed by a practising structural engineer taking into account the relevant loads and selecting panels and connection details accordingly.

Yours faithfully,

Rick Head
BE (hons), MBA, FIEAust CPEng (111270), NPER
General Manager, Western Australia
VDM CONSULTING

Encl.

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9 LOAD CHARTS

BOX BEAM - Permissible UDL - 112mm Panel

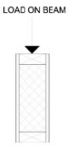
SIPS Wall Thickness: 112 mm

Timber Type Top/Bottom Plate: MGP10

Thickness Top/Bottom Plate: 35 mm

Nail Size: 2.8 mm Diameter

Depth of Box Beam: 300 mm



Permissible UDL Along Lintle (kN/m); Ultimate Limit State														
	Span; Maximum Allowable (mm)													
Nailing Centres (mm)	700	1000	1200	1500	2100	2400	2700	3000	3300	3600	3900	4200	4500	4800
60	25.31	17.72	14.76	11.81	8.44	7.38	6.56	5.91	5.37	4.92	4.49	3.87	3.38	2.97
75	20.25	14.17	11.81	9.45	6.75	5.91	5.25	4.72	4.29	3.94	3.63	3.37	3.15	2.95
100	15.19	10.63	8.86	7.09	5.06	4.43	3.94	3.54	3.22	2.95	2.73	2.53	2.36	2.21
150	10.12	7.09	5.91	4.72	3.37	2.95	2.62	2.36	2.15	1.97	1.82	1.69	1.57	1.48
200	7.59	5.31	4.43	3.54	2.53	2.21	1.97	1.77	1.61	1.48	1.36	1.27	1.18	1.11
Permissible UDL Along Lintle (kN/m); Serviceability Limit State														
Deflection Limit:	700	1000	1200	1500	2100	2400	2700	3000	3300	3600	3900	4200	4500	4800
Span/360	71.13	40.72	29.32	18.76	8.74	6.28	4.64	3.52	2.72	2.14	1.72	1.40	1.15	0.96
Span/500	51.22	29.32	21.11	13.51	6.29	4.52	3.34	2.53	1.96	1.54	1.24	1.00	0.83	0.69
Span/1000	25.61	14.66	10.56	6.75	3.15	2.26	1.67	1.27	0.98	0.77	0.62	0.50	0.41	0.34

SIPS Wall Thickness: 112 mm

Timber Type Top/Bottom Plate: MGP10

Thickness Top/Bottom Plate: 35 mm

Nail Size: 2.8 mm Diameter

Depth of Box Beam: 600 mm

Permissible UDL Along Lintle (kN/m); Ultimate Limit State														
	Span; Maximum Allowable (mm)													
Nailing Centres (mm)	700	1000	1200	1500	2100	2400	2700	3000	3300	3600	3900	4200	4500	4800
60	59.65	41.75	34.79	27.84	19.88	17.40	15.46	13.92	12.65	11.60	10.17	8.77	7.64	6.71
75	53.14	37.19	31.00	24.80	17.71	15.50	13.78	12.40	11.27	10.33	9.54	8.77	7.64	6.71
100	39.85	27.90	23.25	18.60	13.28	11.62	10.33	9.30	8.45	7.75	7.15	6.64	6.20	5.81
150	26.57	18.60	15.50	12.40	8.86	7.75	6.89	6.20	5.64	5.17	4.77	4.43	4.13	3.87
200	19.93	13.95	11.62	9.30	6.64	5.81	5.17	4.65	4.23	3.87	3.58	3.32	3.10	2.91
Permissible UDL Along Lintle (kN/m); Serviceability Limit State														
Deflection Limit:	700	1000	1200	1500	2100	2400	2700	3000	3300	3600	3900	4200	4500	4800
Span/360	163.57	104.05	80.38	56.69	30.78	23.42	18.13	14.27	11.39	9.21	7.53	6.23	5.20	4.39
Span/500	117.77	74.92	57.88	40.82	22.16	16.86	13.06	10.27	8.20	6.63	5.42	4.49	3.75	3.16
Span/1000	58.88	37.46	28.94	20.41	11.08	8.43	6.53	5.14	4.10	3.31	2.71	2.24	1.87	1.58

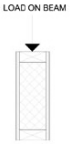
SIPS Wall Thickness: 112 mm

Timber Type Top/Bottom Plate: MGP10

Thickness Top/Bottom Plate: 35 mm

Nail Size: 2.8 mm Diameter

Depth of Box Beam: 900 mm



Permissible UDL Along Lintle (kN/m); Ultimate Limit State														
	Span; Maximum Allowable (mm)													
Nailing Centres (mm)	700	1000	1200	1500	2100	2400	2700	3000	3300	3600	3900	4200	4500	4800
60	87.36	61.15	50.96	40.77	29.12	25.48	22.65	20.38	18.53	16.99	15.68	13.69	11.92	10.48
75	87.36	61.15	50.96	40.77	29.12	25.48	22.65	20.38	18.53	16.99	15.68	13.69	11.92	10.48
100	72.80	50.96	42.47	33.98	24.27	21.23	18.88	16.99	15.44	14.16	13.07	12.13	11.33	10.48
150	48.54	33.98	28.31	22.65	16.18	14.16	12.58	11.33	10.30	9.44	8.71	8.09	7.55	7.08
200	36.40	25.48	21.23	16.99	12.13	10.62	9.44	8.49	7.72	7.08	6.53	6.07	5.66	5.31
Permissible UDL Along Lintle (kN/m); Serviceability Limit State														
Deflection Limit:	700	1000	1200	1500	2100	2400	2700	3000	3300	3600	3900	4200	4500	4800
Span/360	255.86	168.94	134.22	98.89	58.33	46.03	36.82	29.80	24.38	20.14	16.79	14.11	11.95	10.20
Span/500	184.22	121.64	96.64	71.20	42.00	33.14	26.51	21.46	17.56	14.50	12.09	10.16	8.61	7.34
Span/1000	92.11	60.82	48.32	35.60	21.00	16.57	13.26	10.73	8.78	7.25	6.04	5.08	4.30	3.67

BOX BEAM - Permissible UDL - 142mm Panel

SIPS Wall Thickness: 142 mm

Timber Type Top/Bottom Plate: MGP12

Thickness Top/Bottom Plate: 45 mm

Nail Size: 2.8 mm Diameter

Depth of Box Beam: 300 mm

Permissible UDL Along Lintle (kN/m); Ultimate Limit State																
	Span; Maximum Allowable (mm)															
Nailing Centres (mm)	700	1000	1200	1500	2100	2400	2700	3000	3300	3600	3900	4200	4500	4800	5400	6000
60	21.66	15.16	12.63	10.11	7.22	6.32	5.61	5.05	4.59	4.21	3.89	3.61	3.37	3.16	2.81	2.53
65	19.99	13.99	11.66	9.33	6.66	5.83	5.18	4.66	4.24	3.89	3.59	3.33	3.11	2.92	2.59	2.33
75	17.32	12.13	10.11	8.08	5.77	5.05	4.49	4.04	3.67	3.37	3.11	2.89	2.69	2.53	2.25	2.02
100	12.99	9.10	7.58	6.06	4.33	3.79	3.37	3.03	2.76	2.53	2.33	2.17	2.02	1.89	1.68	1.52
150	8.66	6.06	5.05	4.04	2.89	2.53	2.25	2.02	1.84	1.68	1.55	1.44	1.35	1.26	1.12	1.01
200	6.50	4.55	3.79	3.03	2.17	1.89	1.68	1.52	1.38	1.26	1.17	1.08	1.01	0.95	0.84	0.76
Permissible UDL Along Lintle (kN/m); Serviceability Limit State																
Deflection Limit:	700	1000	1200	1500	2100	2400	2700	3000	3300	3600	3900	4200	4500	4800	5400	6000
Span/360	78.92	48.74	36.87	25.22	12.99	9.68	7.36	5.71	4.50	3.50	2.92	2.40	1.99	1.67	1.20	0.90
Span/500	56.82	35.09	26.55	18.16	9.35	6.97	5.30	4.11	3.24	2.59	2.10	1.73	1.43	1.20	0.87	0.64
Span/1000	28.41	17.55	13.27	9.08	4.68	3.48	2.65	2.06	1.62	1.30	1.05	0.86	0.72	0.60	0.43	0.32

SIPS Wall Thickness: 142 mm

Timber Type Top/Bottom Plate: MGP12

Thickness Top/Bottom Plate: 45 mm

Nail Size: 2.8 mm Diameter

Depth of Box Beam: 600 mm

Permissible UDL Along Lintle (kN/m); Ultimate Limit State																
Span; Maximum Allowable (mm)																
Nailing Centres (mm)	700	1000	1200	1500	2100	2400	2700	3000	3300	3600	3900	4200	4500	4800	5400	6000
60	53.92	37.74	31.45	25.16	17.97	15.73	13.98	12.58	11.44	10.48	9.68	8.99	8.39	7.86	6.99	6.29
65	49.77	34.84	29.03	23.23	16.59	14.52	12.90	11.61	10.56	9.68	8.93	8.29	7.74	7.26	6.45	5.81
75	43.13	30.19	25.16	20.13	14.38	12.58	11.18	10.06	9.15	8.39	7.74	7.19	6.71	6.29	5.59	5.03
100	32.35	22.65	18.87	15.10	10.78	9.44	8.39	7.55	6.86	6.29	5.81	5.39	5.03	4.72	4.19	3.77
150	21.57	15.10	12.58	10.06	7.19	6.29	5.59	5.03	4.57	4.19	3.87	3.59	3.35	3.15	2.80	2.52
200	16.18	11.32	9.44	7.55	5.39	4.72	4.19	3.77	3.43	3.15	2.90	2.70	2.52	2.36	2.10	1.89
Permissible UDL Along Lintle (kN/m); Serviceability Limit State																
Deflection Limit:	700	1000	1200	1500	2100	2400	2700	3000	3300	3600	3900	4200	4500	4800	5400	6000
Span/360	170.97	113.14	90.03	66.51	39.45	31.21	25.03	20.30	16.64	13.77	11.50	9.68	8.21	7.01	5.21	3.97
Span/500	123.10	81.46	64.82	47.89	28.41	22.47	18.02	14.62	11.98	9.91	8.28	6.97	5.91	5.05	3.75	2.86
Span/1000	61.55	40.73	32.41	23.94	14.20	11.24	9.01	7.31	5.99	4.96	4.14	3.48	2.95	2.52	1.88	1.43

SIPS Wall Thickness: 142 mm

Timber Type Top/Bottom Plate: MGP12

Thickness Top/Bottom Plate: 45 mm

Nail Size: 2.8 mm Diameter

Depth of Box Beam: 900 mm

Permissible UDL Along Lintle (kN/m); Ultimate Limit State																
Span; Maximum Allowable (mm)																
Nailing Centres (mm)	700	1000	1200	1500	2100	2400	2700	3000	3300	3600	3900	4200	4500	4800	5400	6000
60	91.03	63.72	53.10	42.48	30.34	26.55	23.60	21.24	19.31	17.70	16.34	15.17	14.16	13.28	11.80	10.62
65	87.03	60.92	50.77	40.61	29.01	25.38	22.56	20.31	18.46	16.92	15.62	14.51	13.54	12.69	11.28	10.15
75	75.43	52.80	44.00	35.20	25.14	22.00	19.55	17.60	16.00	14.67	13.54	12.57	11.73	11.00	9.78	8.80
100	56.57	39.60	33.00	26.40	18.86	16.50	14.67	13.20	12.00	11.00	10.15	9.43	8.80	8.25	7.33	6.60
150	37.71	26.40	22.00	17.60	12.57	11.00	9.78	8.80	8.00	7.33	6.77	6.29	5.87	5.50	4.89	4.40
200	28.28	19.80	16.50	13.20	9.43	8.25	7.33	6.60	6.00	5.50	5.08	4.71	4.40	4.12	3.67	3.30
Permissible UDL Along Lintle (kN/m); Serviceability Limit State																
Deflection Limit:	700	1000	1200	1500	2100	2400	2700	3000	3300	3600	3900	4200	4500	4800	5400	6000
Span/360	262.34	177.38	143.59	109.13	68.79	56.07	46.25	38.53	32.36	27.38	23.33	20.00	17.24	14.94	11.40	8.85
Span/500	188.88	127.71	103.39	78.58	49.53	40.37	33.30	27.74	23.30	19.72	16.80	14.40	12.41	10.76	8.21	6.37
Span/1000	94.44	63.86	51.69	39.29	24.76	20.19	16.65	13.87	11.65	9.86	8.40	7.20	6.21	5.38	4.10	3.19

BOX BEAM - Permissible UDL - 162mm Panel

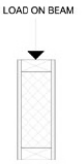
SIPS Wall Thickness: 162 mm

Timber Type Top/Bottom Plate: MGP10

Thickness Top/Bottom Plate: 35 mm

Nail Size: 2.8 mm Diameter

Depth of Box Beam: 300 mm



Permissible UDL Along Lintle (kN/m); Ultimate Limit State														
	Span; Maximum Allowable (mm)													
Nailing Centres (mm)	700	1000	1200	1500	2100	2400	2700	3000	3300	3600	3900	4200	4500	4800
60	22.53	15.77	13.14	10.51	7.51	6.57	5.84	5.26	4.78	4.38	4.04	3.75	3.50	3.29
75	18.02	12.61	10.51	8.41	6.01	5.26	4.67	4.20	3.82	3.50	3.23	3.00	2.80	2.63
100	13.52	9.46	7.88	6.31	4.51	3.94	3.50	3.15	2.87	2.63	2.43	2.25	2.10	1.97
150	9.01	6.31	5.26	4.20	3.00	2.63	2.34	2.10	1.91	1.75	1.62	1.50	1.40	1.31
200	6.76	4.73	3.94	3.15	2.25	1.97	1.75	1.58	1.43	1.31	1.21	1.13	1.05	0.99
Permissible UDL Along Lintle (kN/m); Serviceability Limit State														
Deflection Limit:	700	1000	1200	1500	2100	2400	2700	3000	3300	3600	3900	4200	4500	4800
Span/360	76.30	45.91	34.12	22.77	11.27	8.28	6.22	4.78	3.74	2.97	2.40	1.96	1.62	1.35
Span/500	54.94	33.05	24.57	16.39	8.12	5.96	4.48	3.44	2.69	2.14	1.72	1.41	1.17	0.97
Span/1000	27.47	16.53	12.28	8.20	4.06	2.98	2.24	1.72	1.34	1.07	0.86	0.70	0.58	0.49

SIPS Wall Thickness: 162 mm

Timber Type Top/Bottom Plate: MGP10

Thickness Top/Bottom Plate: 35 mm

Nail Size: 2.8 mm Diameter

Depth of Box Beam: 600 mm

Permissible UDL Along Lintle (kN/m); Ultimate Limit State														
	Span; Maximum Allowable (mm)													
Nailing Centres (mm)	700	1000	1200	1500	2100	2400	2700	3000	3300	3600	3900	4200	4500	4800
60	55.98	39.18	32.65	26.12	18.66	16.33	14.51	13.06	11.87	10.88	10.05	9.33	8.71	8.16
75	44.78	31.35	26.12	20.90	14.93	13.06	11.61	10.45	9.50	8.71	8.04	7.46	6.97	6.53
100	33.59	23.51	19.59	15.67	11.20	9.80	8.71	7.84	7.12	6.53	6.03	5.60	5.22	4.90
150	22.39	15.67	13.06	10.45	7.46	6.53	5.80	5.22	4.75	4.35	4.02	3.73	3.48	3.27
200	16.79	11.75	9.80	7.84	5.60	4.90	4.35	3.92	3.56	3.27	3.01	2.80	2.61	2.45
Permissible UDL Along Lintle (kN/m); Serviceability Limit State														
Deflection Limit:	700	1000	1200	1500	2100	2400	2700	3000	3300	3600	3900	4200	4500	4800
Span/360	168.29	109.76	86.38	62.69	35.89	27.94	22.07	17.67	14.32	11.73	9.70	8.10	6.82	5.79
Span/500	121.17	79.03	62.20	45.14	25.84	20.12	15.89	12.72	10.31	8.44	6.98	5.83	4.91	4.17
Span/1000	60.58	39.52	31.10	22.57	12.92	10.06	7.95	6.36	5.15	4.22	3.49	2.92	2.46	2.08

SIPS Wall Thickness: 162 mm

Timber Type Top/Bottom Plate: MGP10

Thickness Top/Bottom Plate: 35 mm

Nail Size: 2.8 mm Diameter

Depth of Box Beam: 900 mm

Permissible UDL Along Lintle (kN/m); Ultimate Limit State														
	Span; Maximum Allowable (mm)													
Nailing Centres (mm)	700	1000	1200	1500	2100	2400	2700	3000	3300	3600	3900	4200	4500	4800
60	90.94	63.65	53.05	42.44	30.31	26.52	23.58	21.22	19.29	17.68	16.32	15.16	14.15	13.26
75	78.65	55.06	45.88	36.70	26.22	22.94	20.39	18.35	16.68	15.29	14.12	13.11	12.23	11.47
100	58.99	41.29	34.41	27.53	19.66	17.21	15.29	13.76	12.51	11.47	10.59	9.83	9.18	8.60
150	39.33	27.53	22.94	18.35	13.11	11.47	10.20	9.18	8.34	7.65	7.06	6.55	6.12	5.74
200	29.49	20.65	17.21	13.76	9.83	8.60	7.65	6.88	6.26	5.74	5.29	4.92	4.59	4.30
Permissible UDL Along Lintle (kN/m); Serviceability Limit State														
Deflection Limit:	700	1000	1200	1500	2100	2400	2700	3000	3300	3600	3900	4200	4500	4800
Span/360	259.90	174.15	139.97	105.09	64.50	51.87	42.24	34.75	28.86	24.16	20.38	17.32	14.81	12.74
Span/500	187.13	125.39	100.78	75.67	46.44	37.35	30.41	25.02	20.78	17.40	14.68	12.47	10.66	9.18
Span/1000	93.56	62.69	50.39	37.83	23.22	18.67	15.21	12.51	10.39	8.70	7.34	6.23	5.33	4.59

WALL PANEL - RACKING FORCE - 2.7m HIGH

SIPS Wall Thickness:	142 mm					
Height of Pannel:	2700 mm					
Permissible Racking Force per m Length of Wall (kN per m); Ultimate Limit State						
	Wind Load Classification - See Note 3					
Axial Load Long Panel (kN/m)	***N3***	***N4***	***C1***	***C2***	***C3***	***C4***
2.5	*2.30*	*2.17*	*2.20*	*2.02*	*1.76*	*1.48*
5	*2.12*	*1.99*	*2.02*	*1.84*	*1.58*	*1.30*
7.5	*1.94*	*1.81*	*1.84*	*1.66*	*1.40*	*1.12*
10	*1.76*	*1.63*	*1.66*	*1.48*	*1.22*	*0.94*
Permissible Racking Force per m Length of Wall (kN per m); Serviceability Limit State - See Note						
Deflection Limit:	***N3***	***N4***	***C1***	***C2***	***C3***	***C4***
Span/150	*3.19*	*3.19*	*3.19*	*3.19*	*3.19*	*3.19*

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WALL PANEL - RACKING FORCE - 3m HIGH

SIPS Wall Thickness:	142 mm					
Height of Panel:	3600 mm					
Permissible Racking Force per m Length of Wall (kN per m); Ultimate Limit State						
	Wind Load Classification					
Axial Load Long Panel (kN/m)	***N3***	***N4***	***C1***	***C2***	***C3***	***C4***
2.5	*2.06*	*1.82*	*1.89*	*1.57*	*1.11*	*0.61*
5	*1.88*	*1.65*	*1.71*	*1.39*	*0.93*	*0.43*
7.5	*1.70*	*1.47*	*1.53*	*1.21*	*0.75*	*0.25*
10	*1.52*	*1.28*	*1.35*	*1.03*	*0.57*	*0.07*
Permissible Racking Force per m Length of Wall (kN per m); Serviceability Limit State - See Note						
Deflection Limit:	***N3***	***N4***	***C1***	***C2***	***C3***	***C4***
Span/150	*1.79*	*1.79*	*1.79*	*1.79*	*1.79*	*1.79*

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Technical Appraisal – Evidence of Suitability

STRUCTURAL INSULATED PANEL SYSTEM

Report No. 104609

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Date of Issue: **24 September 2009**

MILESTONE mbc BUILDING COMPLIANCE

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PURPOSE

Roof or wall product to be used as structural components in Class 1 buildings on traditional concrete slab on ground or frame construction on pad footings. This technical appraisal provides evidence of suitability under the Building Code of Australia 2009 (Volume two) Clause 1.2.2 (a) (iii)

APPLICANT

SIPS Industries Australia Pty Ltd (ACN 135 626 256) c/- Habitat International, Unit 8, 27 Hood Street, Subiaco, WA, 6008

PRODUCT

The Structural Insulated Panel System (SIPS) consists of two outer skins of 11mm oriented strand board (OSB) and an insulating core of expanded polystyrene (EPS) in standard overall thicknesses of 112mm and 162mm.

The prefabricated lightweight panels are used as principal load bearing components for walls and roof construction.

The panels are typically 1.2m wide and are jointed with OSB or timber splines. These splines are glued and nailed into position. The timber grade is F5, the EPS is grade SL and the OSB is an OSB/3 product manufactured by Egger in Germany.

TECHNICAL OPINION

In the opinion of Milestone Building Compliance, the Structural Insulated Panel System (SIPS) is suitable for use as structural components in non-fire rated wall, roof or ceiling assemblies under the following conditions:

1. The building is constructed in accordance with the manufacturer's construction manual including SIPS Design Guide Part 1: Structural Design, VDM Consulting certification, load charts No 2B & 4 & construction details (refer Appraisal – Supporting documentation below).
2. Each building project must be reviewed and certified by a professional engineer as defined by the BCA.
3. The design of the footings is appropriate for the properties of the soil in accordance with AS2870-1996 (Amdt 1-4)
4. The design of the building complies with the manufacturers construction manual including SIPS Design Guide Part 1: Structural Design, Load Charts No 2B & 4 & construction details (refer Appraisal – Supporting documentation below) for the loads specified in AS/NZS1170 (Parts 1-4)

5. In wet areas, walls are protected by a membrane sealing system in accordance with AS3740-2004.
6. All walls and roofs be protected from the elements by suitable cladding installed in accordance with AS1562-1992.
7. Termite barrier installed in accordance with AS3660-2000.

BUILDING CODE OF AUSTRALIA 2009 (VOLUME TWO)

In the opinion of Milestone Building Compliance, the Structural Insulated Panel System (SIPS) when designed and installed in accordance with this Technical Appraisal and conditions listed herein will satisfy the performance requirements of Clauses P2.1, P2.2.2, and P2.4.1.

Notes:

1. The validity of this technical appraisal specifically relates to the current version of the BCA. This technical appraisal will need to be revalidated upon future amendments of the BCA.

LIMITATIONS

The following limitations apply to this technical appraisal for the SIPS product:

1. This technical appraisal applies only to the use of the SIPS product as described herein.

2. This technical appraisal will be withdrawn or amended if Milestone Building Compliance considers that a change in design, manufacturing quality or third party certification renders the basis of the appraisal invalid, or if reported field experience demonstrates unsatisfactory quality of performance.

Milestone Building Compliance has assessed the following aspects in undertaking this appraisal:

1. The ability of the product to support permanent, imposed and other actions on the roof and walls in accordance with:
   - AS/NZS 1170.0/2002 General principles
   - AS/NZS 1170.1/2002 Permanent, imposed and other actions;
   - AS/NZS 1170.2/2002 Wind actions;
   - AS/NZS 1170.3/2003 Snow and ice actions;
   - AS/NZS 1170.4/1993 Earthquake loads; and
   - AS/NZS 1170.4/2007 Earthquake actions in Australia.
2. The ability of the product to secure roof framing members to resist uplift loadings;
3. The ability of the product, when integrated with other building materials to achieve adequate weatherproofing;
4. The thermal insulation properties of the product;

APPRAISAL

DESCRIPTION

The following description is based on information provided by the applicant.

Components:
The Structural Insulated Panel System (SIPS) consists of two outer skins of 11mm oriented strand board (OSB) and an insulating core of expanded polystyrene (EPS) in standard overall thicknesses of 112mm and 162mm.

The prefabricated lightweight panels are used as principal load bearing components for walls and roof construction.

The panels are typically 1.2m wide and are jointed with OSB or timber splines. These splines are glued and nailed into position. The timber grade is F5, the EPS is grade SL and the OSB is an OSB/3 product manufactured by Egger in Germany.

The on-site application of SIPs must be independently designed and certified by an independent professional engineer (as defined by the BCA)

Footings:

The design of the footings and supporting structure is dependant on soil classification and loading.

Walls:
The wall panels are glued with a water resistant water based structural adhesive and nailed with OSB or timber splines. All wall junctions are screwed with specialised SIPS screws as stipulated by the design engineer.

The external surface of the wall must be protected from the weather by a form of cladding, either polymer cement renders, natural stone, brick or brick slip cladding, timber or metal cladding. A breathable membrane must be installed between the SIPS and the external wall cladding.

Roofs:
The roof panels are glued with a water resistant water based structural adhesive and nailed with OSB or timber splines and fixed on the rake supported by traditional beam construction at spacings design applying Load Chart No 4, Suitable vapour retarder must be installed over spline joints. A breathable membrane must be installed between the SIPS and the external roof cladding.

All roof /wall junctions are to be screwed with specialised SIPS screws and strapped as stipulated by the design engineer.

DESIGN INFORMATION

General
The basic design of a SIPS building is constructed by assembling prefabricated insulated panels

The prefabricated lightweight panels are used as principal load bearing components for walls and roof construction.

The panels are typically 1.2m wide and are jointed with OSB or timber splines. These splines are glued and nailed into position. The timber grade is F5, the EPS is grade SL and the OSB is an OSB/3 product manufactured by Egger in Germany.

Loads
The design of the building takes into account loads as specified in:

- AS/NZS 1170.0/2002 General principles
- AS/NZS 1170.1/2002 Permanent, imposed and other actions;
- AS/NZS 1170.2/2002 Wind actions;
- AS/NZS 1170.3/2003 Snow and ice actions;
- AS/NZS 1170.4/1993 Earthquake loads; and
- AS/NZS 1170.4/2007 Earthquake actions in Australia.

Durability
The two outer skins of 11mm oriented strand board (OSB) Egger OB'Brace have a durability rating of H2 in accordance with AS1684-1999.

The expanded Styropor (EPS) has no nutritive value for micro-organisms and does not rot. The expanded Styropor must be enclosed to prevent weathering or attack from rodents or birds. The product must also be protected from solvents, saturated hydrocarbons and gasoline. Refer to product data sheet.

The structural adhesive used to join the OSB boards to the expanded Styropor is Rakoll – GXL 4 a PVAc adhesive with excellent water resistance. Refer to product data sheet.

Thermal Properties
The 112mm SIPS panel achieves a R–Value of 2.708 m^2K/W and a U-Value of 0.369 W/m^2K .

The 162mm SIPS panel achieves a R–Value of 4.023 m^2K/W and a U-Value of 0.249 W/m^2K .

SUPPORTING DOCUMENTATION

The following documents where used in carrying out the appraisal:

Manufacturer's Information

EGGER Holzwerkstoffe Wismar GmbH & Co.KG Am Haffeld 1, 23970 Wismar, Germany info-wis@egger.com **OS'Brace® Product specification**. This document demonstrates that the durability, termite resistance and racking resistance properties of the OSB product complies with the performance requirements of the BCA on the basis of equivalence with overseas standards.

SIPS Wall & Roof Transverse Loading - Load Chart No. 4 and Wall Axial Loading Chart No. 2B
This document provides engineering design information.

EGGER OS'Brace® - H2 Blue – Product Data Sheet, Code No. DBWISO 61.E
This sheet provides information on the physical properties of the OSB product including termite resistance, thermal conductivity and water vapour permeability.

BASF Styropor- Technical information on Building construction – properties of expanded Styopor.
This technical report demonstrates that the service life of expanded Styopor is virtually unlimited if the material is used properly. The report provides detailed information on the physical properties of Styopor.

Building Research Establishment Ltd, 2008, *The Performance in Fire of Structural Insulated Panel Systems*, BD2710, 247931 D3(V1). This report reviews data on the performance of SIPS and considers the ambient temperature material properties and performance in addition to performance in fire.

Forestry Commission of NSW, Approval of Preservative Treatment and registration of Brand under the Timber Marketing Act 1977 (NSW) (Section 20)
This certificate approval No. 527 70 H2 approves the brand and treatment of OSB boards with Permethrin against insects to a treatment level of H2.

HB Fuller Deutschland GmbH, Rakoll – Woodworking Adhesives Technical Data Sheet – GXL 4, Aug 2005
This data sheet provides technical information on the physical properties of Rakoll adhesive.

Starfast SIP Fasteners Information Sheet – This sheet provides the specification and application including the tensile and shear strengths of Starfast fasteners

SIPS Industries Australia – Construction details
1. SIP wall to foundation detail DWG No. S-01
2. SIP joining detail DWG No. W-02
3. SIP joining detail DWG No. W-02 (alternative)
4. SIP Corner detail DWG No. W-04
5. SIP Wall intersection DWG No. W-14
6. SIP at steel column DWG No. W-01
7. Exploded SIP wall
8. SIPS Intermediate Floor level DWG No. F-03
9. SIPS Eaves Detail DWG No. R-20
10. SIPS Truss detail DWG No. R-05
11. SIPS Valley detail DWG No. R-11
12. SIPS Mansard detail DWG No. R-02
13. SIPS Overlap ridge detail DWG No. R-15
14. SIPS Ridge detail DWG No. R-01
15. SIPS Typical cross section DWG No. Sec-02

SIPS Industries Australia, Design Guide, Part 1 Structural Design prepared by WMA Ltd Structural and Civil Engineering Consultancy
This guide concludes that the SIPS panels *"can be designed in accordance with AS1720.1 to provide sufficient strength and stiffness to resist the applied loading associated with residential structural design."*

SIPS Industries Ltd, Description, Performance and Design Considerations. This leaflet provides general information on the SIPS product.

EGGER Holszwerkstoffe Wismar GmbH & Co. KG, Egger OS'Brace® Equivalency Statement, 10 Oct 2008.
This statement certifies that the Egger OS'Brace® Bracing systems by certification from a professional engineer and comparison to BCA deemed-to-satisfy provisions is equivalent to the deemed-to-satisfy compliant Ply Bracing System.

VDM Consulting, Structural Certification, 16th September 2009, Ref WS2091278
This certification confirms the SIPS product complies with the Building Code of Australia Clause P2.1 Structure and Australian Standards 1170 Part 1-4. This certification refers to:
Load Charts No. 2B & 4
Standard Construction Details
1. SIPS Do's and Don'ts – SIP 1000
2. Panel DON'TS – SIP 1000a
3. Plate Connections – SIP 1010
4. Sealant Application – SIP 1010a
5. High Load Shear Wall Plate Connections – SIP 1010b
6. Spline Connection Surface Spline – SIP 1020
7. Spline Connection Engineered Wood – SIP 1020a
8. Spline Connection Double Spline – SIP 1020d
9. Block Spline Connection – SIP 1020g
10. Spline Connection I-Beam Spline Connection – SIP 1020h
11. High Load Shear Wall Spline Connection – SIP 1020k
12. Steel Post – Spline connections – SIP 1020L
13. Corner Connection – SIP 1030
14. Angled Corner Connection – SIP 1030b

15. Slab Foundation Connection – SIP 1040
16. Floor Joist Bearing on Wall Panel – SIP 1090
17. Interior Wall Connection – SIP 1110
18. Interior SIP Wall Connection – SIP 1110a
19. Interior SIP Wall Connection – SIP 1110b
20. Roof Ridge Plumb Cut/Cantilever Ridge – SIP 1210b
21. Roof Ridge – Square Cut – SIP 1210c
22. Ridge Beam Connection – SIP 1210e
23. Roof to SIP wall Connection – SIP 1220b
24. Truss Connection – SIP 1240
25. Electrical Chase – SIP 1290
26. Panel Fixing – SIP - 1350

SIPS Industries – U-Value Calculations by BRE U-Value Calculator version 1.21f, 24 June 2009. This report describes the thermal properties of the 112mm thick and the 162mm thick SIPS panels using the BS EN ISO 6946 Calculation Method.

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Test Reports

University of Dundee, Department of Civil Engineering, Oriented Strand Board and Polystyrene Sandwich Panel – Test Report, Dr NK Subedi & Dr PS Baglin, Oct 1999
This test report demonstrates the failure loads of three SIPS specimens. The results identified "*the presence of unbonded areas in the panel will reduce its capacity to resist the load*".

University of Dundee, Department of Civil Engineering, 4800x1200x170mm Large Sandwich Panel Oriented Strand Board and Polystyrene – Test Report, Dr NK Subedi & Dr PS Baglin, Dec 2000
This test report demonstrates the deflection rates, ultimate load and relative slip between the boards and edge joists.

University of Dundee, Department of Civil Engineering, 4800x1200x170mm Large Sandwich Panel Oriented Strand Board and Polystyrene – Panel 2: Sustained Load Test - Test Report, Dr NK Subedi & Dr PS Baglin, Feb 2001
This test report "highlights that quality control is absolutely important in the manufacture of such panels in order to maintain consistent structural behaviour and overall strength.

University of Dundee, Department of Civil Engineering, Test Report on Composite Sandwich Panels OSB- EPS-OSB, Dr NK Subedi & Dr PS Baglin, April 2000
This test report evaluates the structural behaviour of the panel and the effectiveness of the adhesive between the polystyrene core and the timber skin.