British Board of Agrément

Bucknalls Lane
Garston
Watford
Herts WD25 9BA

Tel: + 44 (0) 1923 665300

Fax: + 44 (0) 1923 665301

e-mail: mail@bba.star.co.uk

website: www.bbacerts.co.uk

Authorised and notified according to Article 10 of the Council Directive (89/106/EEC) of 21 December 1988 on the approximation of laws, regulations and administrative provisions of Member States relating to construction products.

BBA APPROVAL INSPECTION TESTING CERTIFICATION
TECHNICAL APPROVALS FOR CONSTRUCTION

Designated by Government to issue European Technical Approvals

Member of EOTA

European Technical Approval ETA-11/0466

Trade name:	Kingspan TEK
Holder of approval:	Kingspan Insulation Ltd Pembridge Leominster Herefordshire HR6 9LA United Kingdom Tel: + 44 (0)1544 387 382 Fax: + 44 (0)1544 387 482 e-mail: technical.uk@tek.kingspan.com website: www.tek.kingspan.com
Generic type and use of construction product:	Prefabricated Wood-based Loadbearing Stressed Skin Panels
Valid from: to:	4 January 2012 4 January 2017
Manufacturing plant:	Kingspan Insulation Ltd (Selby Plant) Sherburn Enterprise Park Enterprise Way Sherburn-in-Elmet Leeds NorthYorkshire LS25 6NA United Kingdom
This European Technical Approval contains:	12 pages plus three Annexes which form an integral part of the document.

I LEGAL BASES AND GENERAL CONDITIONS

1 This European Technical Approval is issued by the British Board of Agrément in accordance with:

- Council Directive 89/106/EEC of 21 December 1988 [Construction Products Directive (CPD)] on the approximation of laws, regulations and administrative provisions of Member States relating to construction products[1], modified by the Council Directive 93/68/EEC of 22 July 1993[2]
- UK implementation of CPD Statutory Instruments 1991, No 1620. The Building and Building Construction Products Regulations 1991 — made 15 July 1991, laid before Parliament 22 July 1991, coming into force 27 December 1991, and amended by the Construction Products (Amendment) Regulations 1994 (Statutory Instruments 1994, No 3051)
- Common Procedural Rules for Requesting, Preparing and the Granting of European Technical Approvals set out in the Annex to Commission Decision 94/23/EC[3]
- EOTA Guideline for European Technical Approval ETAG 019 *Prefabricated wood-based loadbearing stressed skin panels*, January 2005.

2 The British Board of Agrément is authorised to check whether the provisions of this European Technical Approval are met. Checking may take place in the manufacturing plant. Nevertheless, the responsibility for the conformity of the products to the European Technical Approval and for their fitness for the intended use remains with the holder of the European Technical Approval.

3 This European Technical Approval is not to be transferred to manufacturers or agents of manufacturers other than those indicated on page 1, or manufacturing plants other than those indicated on page 1 of this European Technical Approval.

4 This European Technical Approval may be withdrawn by the British Board of Agrément, in particular after information by the Commission on the basis of Article 5(1) of Council Directive 89/106/EEC.

5 Reproduction of this European Technical Approval, including transmission by electronic means, shall be in full. However, partial reproduction can be made with the written consent of the British Board of Agrément. In this case partial reproduction has to be designated as such. Texts and drawings of advertising brochures shall not contradict or misuse the European Technical Approval.

6 The European Technical Approval is issued by the approval body in its official language. This version should correspond to the version circulated within EOTA. Translations into other languages have to be designated as such.

II SPECIFIC CONDITIONS OF THE EUROPEAN TECHNICAL APPROVAL

1 Definition of product and intended use

1.1 Definition of product

The product forms a panelised method of construction. Panels are available with a nominal thickness of either 142 mm or 172 mm. Each panel has two outer skins of 15 mm thick OSB/3 (oriented strand board, type 3), separated by a core of 112 mm or 142 mm thick, zero-rated Ozone-Depleting Potential, rigid polyurethane (PUR).

The panels are available in widths ranging from 200 mm to a maximum of 1220 mm, and lengths up to 7500 mm, and are supplied in the appropriate shapes and sizes for each project . Other components, such as sealant, fixings and jointing pieces may be required to enable installation to be made in accordance with the ETA holder's recommendations.

1.2 Intended use

The panels are for use in single- or multiple-occupancy constructions up to four storeys high as the loadbearing inner leaf of an external wall, a loadbearing internal wall, single or double leaf(s) of a separating wall or pitched roofing panels where Essential Requirements 1, 2, 3 and 6 *Mechanical resistance and stability, Safety in case of fire, Hygiene, health and environment and Energy economy and heat retention* respectively (CPD, Annex 1), apply.

The panels are for use in timber structures subject to the dry, internal conditions defined by service classes 1 and 2 of EN 1995-1-1 : 2004 and for members subject to static or quasi-static loading.

The panels may also be used as infill panels to multi-storey framed buildings subject to design and fire constraints on height and method of fixing to structural frames.

The provisions made in this ETA are based on an assumed intended working life for the panels of 50 years. The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be used as a means for selecting the appropriate product in relation to the expected economically reasonable working life of the works.

---

(1) Official Journal of the European Communities No L40, 11.2.1989, p12.

(2) Official Journal of the European Communities No L220, 30.8.1993, p1.

(3) Official Journal of the European Communities No L17, 20.1.1994, p34.

2 Characteristics of product and methods of verification

2.1 Characteristics of product

The panels are available in the range given in part II, section 1, and have the characteristics detailed in Annexes 2 and 3.

Changes to the components of the system, or in the production process of the components, that could result in the details held by the BBA being incorrect, should be notified to the BBA before the changes are introduced. The BBA will decide whether the changes affect the ETA and consequently the validity of the CE marking and whether further assessment and alterations to the ETA are required.

2.2 Methods of verification

The assessment of fitness for the intended use (see part II, section 1) has been made in accordance with ETAG 019 *Prefabricated wood-based loadbearing stressed skin panels*, January 2005.

2.2.1 Essential Requirement 1 — Mechanical resistance and stability

The mechanical properties, design load-carrying capacities for the wall and roof panels are given in Annex 2, and have been derived in accordance with ETAG 019. They should be used for designs in accordance with EN 1995-1-1, EN 1991-1-1, EN 1991-1-2 and EN 1991-1-3 or an appropriate national code.

The load-carrying capacities have been derived by calculation and calculation assisted by test. Additional strength of the panels can be achieved using structural engineering principles and introducing structural members such as ribs or posts within the panels.

The BBA has assessed a method of design analysis, developed by the ETA holder. The method is based on TR019 in respect of the roof panels and sandwich theory in respect of the wall panels. The BBA holds the data on file.

2.2.2 Essential Requirement 2 — Safety in case of fire

In relation to reaction to fire, the panel skins are classified as D-s2, d0, in accordance with EN 13501-1 : 2007 by reference to EC Decision 2003/43/EC. Performance in relation to fire resistance would be determined for the complete structural element with any associated finishes, hence, for this Essential Requirement, there are no aspects of performance relevant to a panel and, therefore, *No Performance Determined* is stated.

2.2.3 Essential Requirement 3 — Hygiene, health and environment

According to the manufacturer's declaration, the product specification has been compared with the dangerous substances, taking account of Directive 67/548/EEC, Regulation (EC) No 1272/2008 *Indicative list of dangerous substances*, Council Directive 76/769/EEC and the list on the database established on the EC construction website to verify that it does not contain such substances above the acceptable limits. The formaldehyde potential of the OSB skins are designated Class E1 in accordance with EN 13986 : 2004. According to the manufacturer's declaration, the rigid urethane insulation core, when enclosed between the OSB skins, is suitable for use in interior spaces.

In addition to the specific clauses relating to dangerous substances contained in this European Technical Approval, there may be other requirements applicable to the products falling within its scope (eg transposed European legislation and national laws, regulations and administrative provisions). To meet the provisions of the EU Construction Products Directive, these requirements need also to be complied with, when and where they apply.

2.2.4 Essential Requirement 4 — Safety in use

2.2.4.1 Impact/shock resistance

When used to construct walls and roofs the panels will normally be protected by internal and external finishes, therefore, a *No Performance Determined* is stated.

2.2.5 Essential Requirement 5 — Protection against noise

Laboratory testing to BS EN ISO 140-4 : 1998 (airborne) and field tests to BS EN ISO 10140-2 : 2010 indicate that the panels will contribute to reducing sound transmission in an internal/external wall and in a separating wall including flanking sound (see Annex 1, Figure 4).

2.2.6 Essential Requirement 6 — Energy economy and heat retention

Calculations for particular constructions can be carried out in accordance with EN ISO 6946 : 2007. Details of thermal conductivities are given in Annex 3, Table 1.

2.2.7 Aspects of durability, serviceability and identification

The panels can be used in service classes 1 and 2 as explained in EN 1995-1-1 : 2004 and in Hazard Classes 1 and 2 as specified in EN 335-1 : 2006. The products may be exposed directly to the weather for a short time during installation.

The ability of the panels to resist loads without undue deflection (serviceability) is dealt with in the section 2.2.1 *Essential Requirement 1 — Mechanical resistance and stability*.

Each panel bears the manufacturer's identification mark, the product type and CE marking as described in section 3.3.

3 Evaluation of Conformity and CE Marking

3.1 Attestation of Conformity system

The system of attestation of conformity applied to this product shall be that laid down in the CPD, Annex III, 2(i) (referred to as System 1).

3.2 Responsibilities

3.2.1 Tasks for the manufacturer, factory production control

The manufacturer continues to operate a factory production control system. All elements, requirements and provisions adopted by the manufacturer are documented to ensure that product conforms with this ETA.

The manufacturer shall only use raw materials supplied with the relevant inspection documents as laid down in the prescribed test plan[4]. The raw materials shall be subject to controls and tests by the manufacturer before acceptance. Checks on incoming materials shall include control of the certificates of conformity presented by suppliers (comparison with nominal values) by verifying dimensions and determining material properties.

The manufactured panels are checked for:

- thermal conductivity (initial and aged)
- shear strength
- tensile strength
- compressive strength
- closed-cell content
- nominal density
- dimensional accuracy
- visual quality.

The frequency of controls and tests conducted during production and on the assembled panel is laid down in the prescribed test plan, taking account of the manufacturing process of the panel.

The results of factory production control are recorded and evaluated. The records include at least:

- designation of the product, basic material and components
- type of control or testing
- date of manufacture of the product and date of testing of the product or basic material and components
- result of control and testing and, if appropriate, comparison with requirements
- signature of person responsible for factory production control.

The records shall be presented to the inspection body involved in the continuous surveillance.

Details of the extent, nature and frequency of testing[4] and controls to be performed within the factory production control shall correspond to the prescribed test plan included in the manufacturer's technical documentation relating to this European Technical Approval.

3.2.2 Tasks for approved bodies

3.2.2.1 Initial type-testing of the product

For initial type-testing the results of the tests performed as part of the assessment for the European Technical Approval shall be used unless there are changes in the production line or plant. In such cases, the necessary type-testing has to be agreed between the British Board of Agrément and the approved body involved.

3.2.2.2 Initial inspection of factory and of factory production control

The approved body shall ascertain that, in accordance with the prescribed test plan, the factory, in particular the staff and equipment, and the factory production control, are suitable to ensure a continuous and orderly manufacturing of the panels with the specifications given in part II, section 1.1.

3.2.2.3 Continuous surveillance

The approved body shall visit the factory at least twice per year for routine inspections. It shall be verified that the system of factory production control and the specified manufacturing processes are maintained, taking account of the prescribed test plan. The results of product certification and continuous surveillance shall be made available on demand by the certification body to the British Board of Agrément. Where the provisions of the European Technical Approval and the prescribed test plan are no longer fulfilled, the certificate of conformity shall be withdrawn by the certification body.

3.3 CE Marking

The CE Marking[5] shall be affixed to each panel and the accompanying documentation. The CE symbol shall be accompanied by the following information:

- identification number of the certification body
- identification of the product
- name or identification mark of producer and the registered address of the producer
- the last two digits of the year in which the CE marking was affixed
- number of the EC certificate of conformity
- number of the European Technical Approval.

---

(4) The prescribed test plan has been deposited with the British Board of Agrément and is only made available to the approved bodies involved in the conformity attestation procedure.

(5) See EU commission Guidance Paper D CE *Marking under the Construction Products Directive*.

4 Assumptions under which the fitness of the product for the intended use was favourably assessed

4.1 Manufacturing

The panels are manufactured in accordance with the provisions of the European Technical Approval using the manufacturing processes as identified in the inspection of the plant by the British Board of Agrément and the approved body and laid down in the technical documentation.

4.2 Installation

The panels are deemed fit for their intended use provided:

- they are designed/structurally assessed in accordance with the Certificate holder's method of design analysis or load/span tables derived from the design analysis, EN 1995-1-1 : 2004 (Eurocode 5), EN 1991-1-1, EN 1991-1-2 and EN 1991-1-3 (Eurocode 1) or an appropriate national code. Design and detailing of structures incorporating the panels should be carried out by a suitably experienced person in accordance with the manufacturer's instructions and the requirements of this ETA
- verifiable calculation, notes and drawings are prepared taking account of the loads to be resisted.

4.3 Criteria

The fitness for use of the panels can be assumed if they are installed correctly in accordance with the following requirements:

- installation is carried out by personnel under the direction of supervisors, all of whom are appropriately qualified for this work
- installation is in accordance with the manufacturer's specifications and drawings prepared for that purpose, and the appropriate tools are used
- concrete foundations are within the dimensional tolerances and level (± 5 mm from datum) and where the panels are used as infill elements, the accuracy of structural frame and method of fixing is in accordance with the manufacturer's recommendations.

5 Recommendations

5.1 Recommendations on packaging, transport and storage

Delivery and site storage must be carried out in accordance with the manufacturer's instructions. During transportation and temporary storage the panels are shrink-wrapped with the edges protected.

They should be stored flat (no more than 16 panels high) over suitable stillage to a slight fall (to allow rain run-off). Bearers should be at 600 mm (maximum) centres (end bearers not more than 150 mm from edge of panel), and aligned vertically between individual packs in accordance with the manufacturer's guidelines.

The panels and all components should be stored inside, or in dry, sheltered conditions at least 150 mm off the ground, covered with opaque polythene sheeting or tarpaulin until the panels and components are to be used for erection.

5.2 Recommendations on use, maintenance and repair

The assessment of the fitness for use is based on the assumption that maintenance is not required during the assumed intended working life.

The panels can withstand the normal loads associated with site handling and installation. Damaged panels or those with facings with a moisture content greater than 16% should not be used.

Installed panels should be protected with with a vapour-permeable membrane to EN 13859-1 : 2010 or EN 13859-2 : 2010 appropriately, prior to the addition of the final weather-proof construction materials.

It is the responsibility of the manufacturer to ensure that the information on the specific conditions given in part II, sections 1, 2, 4.2 and 4.3, is given to those concerned. This information may be made by replicating the respective parts of the European Technical Approval.

BBA APPROVAL INSPECTION TESTING CERTIFICATION
TECHNICAL APPROVALS FOR CONSTRUCTION

On behalf of the British Board of Agrément

Brian Chamberlain
Head of Approvals — Engineering

Greg Cooper
Chief Executive

Date of issue: 4 January 2012

ANNEX 1 PRODUCT DETAILS

Figure 1 Typical wall and roof construction

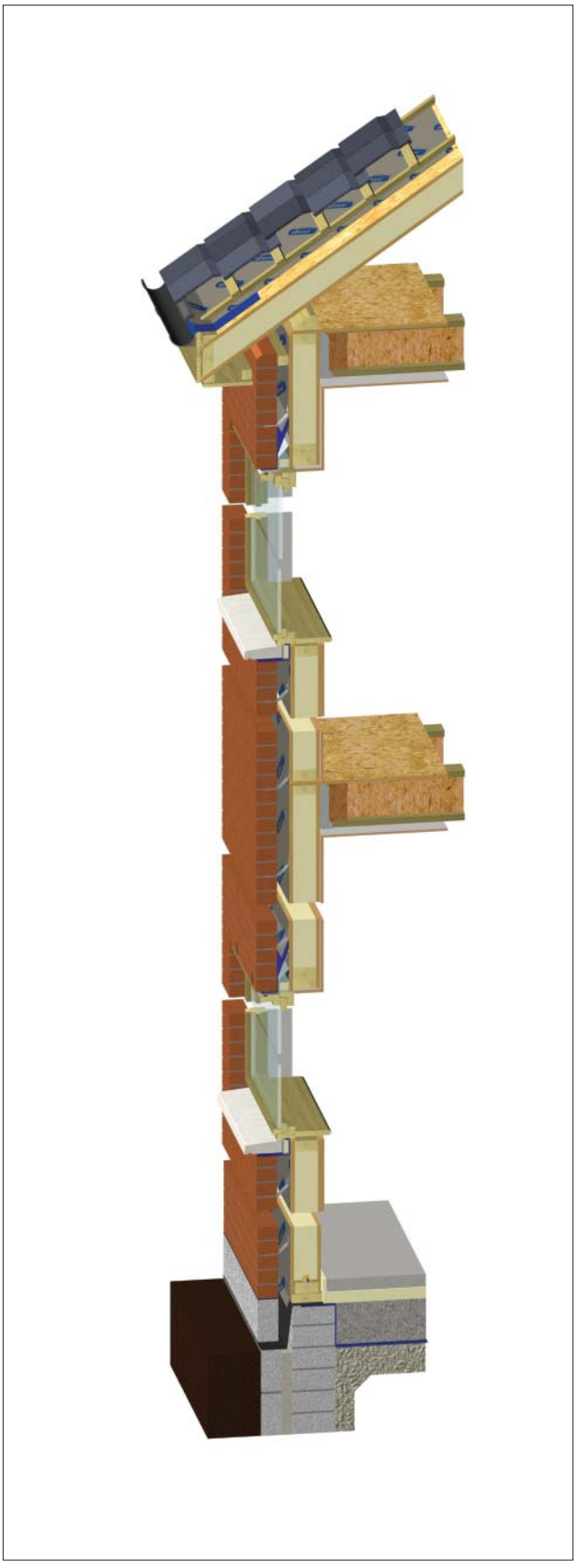
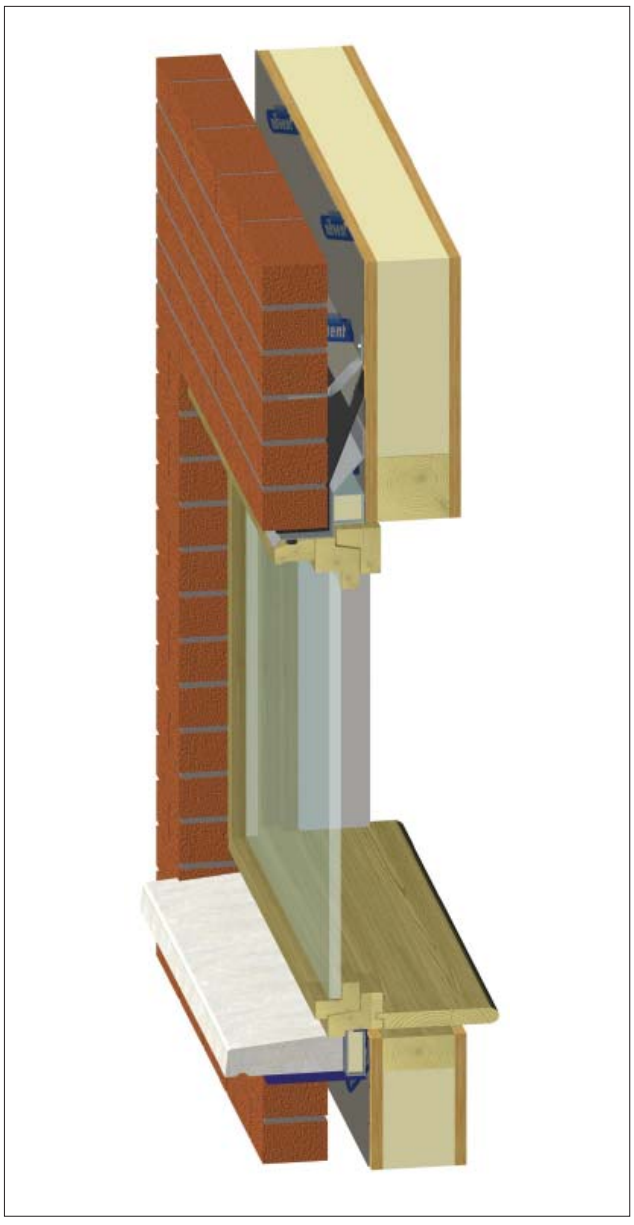


Figure 2 Cassette joint system

Figure 3 External wall — window detail including lintel



ANNEX 1 PRODUCT DETAILS (continued)

Figure 4 Separating wall details

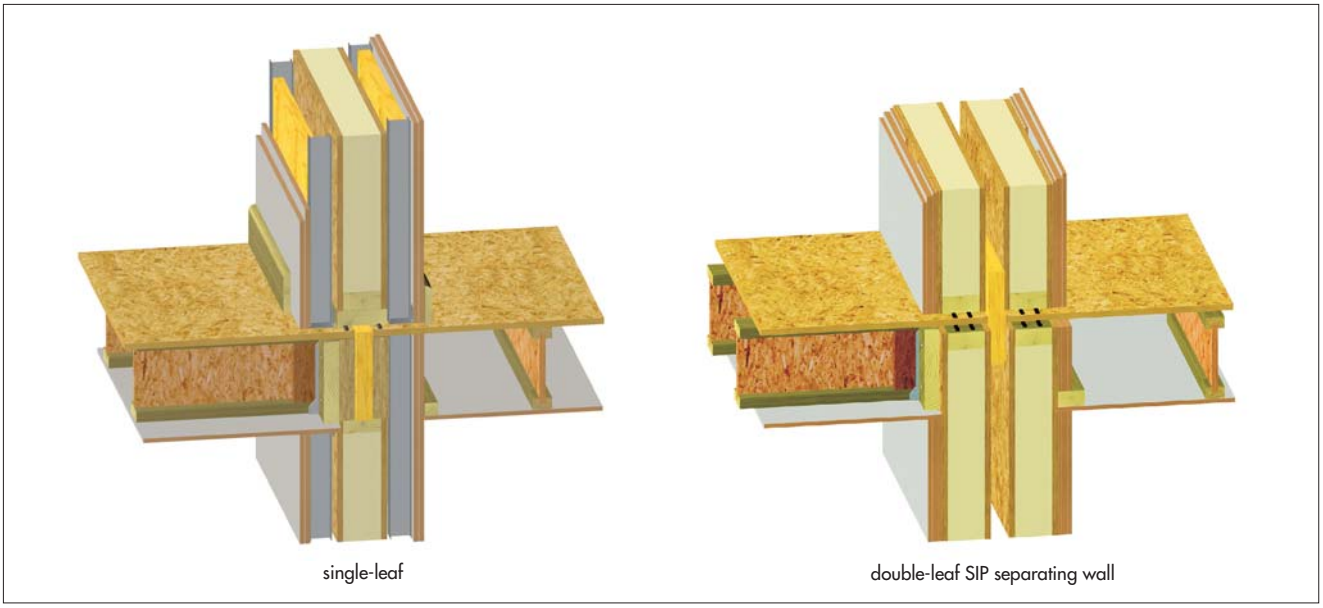
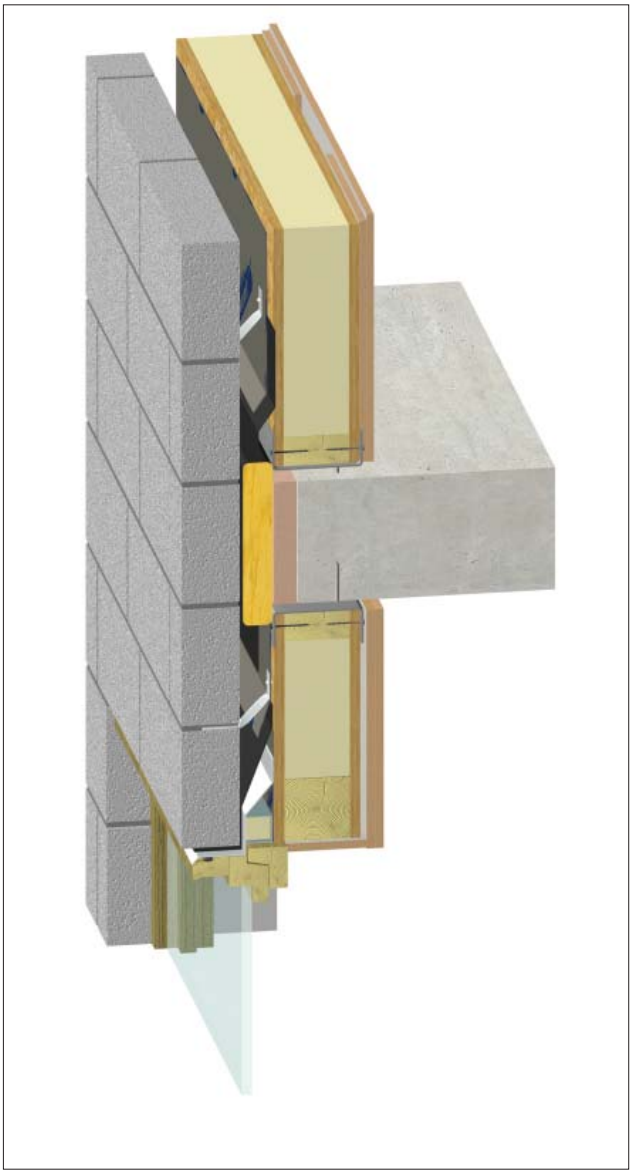


Figure 5 Infill panel



ANNEX 2 Design load tables for Kingspan TEK 142 and TEK 172 wall and roof panels

Table 1 TEK 142 wall — vertical load capacity[1]

Height *H*	Vertical load capacity[2] (kN·m^{-1})				
	Load duration				
(m)	Permanent	Long-term	Medium-term	Short-term	Instantaneous
2.4	14.209	28.708	40.191	50.477	60.674
2.7	13.444	27.157	38.019	50.477	60.674
3.0	12.681	25.610	35.854	50.477	60.674
3.5	11.446	23.110	32.354	50.477	60.674
4.0	10.291	20.771	29.079	50.477	60.674
4.8	8.653	17.456	24.439	50.477	60.674

(1) Without horizontal load.
(2) Maximum vertical load per wall height for each load duration.

Table 2 TEK 142 wall — horizontal load capacity[1]

Height *H*	Horizontal load capacity[2] (kN·m^{-1})	
	Load duration	
(m)	Short-term	Instantaneous
2.4	4.18	4.18
2.7	3.38	3.38
3.0	2.75	2.75
3.5	2.00	2.00
4.0	1.49	1.49
4.8	0.97	0.97

(1) Without vertical load, ie as an infill wall.
(2) Maximum wind load for each wall height.

Table 3 TEK 142 wall — combined vertical and horizontal load capacity[1]

Height *H*	Applied horizontal load (kN·m^{-2})	Vertical load capacity (kN·m^{-1})	
	Duration		
(m)	Instantaneous	Short-term	Instantaneous
2.4	1.125	50.48	60.67
2.4	1.500	50.48	60.67
2.4	2.250	50.48	58.42
2.7	1.125	50.48	60.67
2.7	1.500	50.48	60.68
2.7	2.250	50.48	51.64
3.0	1.125	50.48	60.67
3.0	1.500	50.48	57.35
3.0	2.250	44.06	44.06
3.5	1.125	50.48	56.80
3.5	1.500	47.75	47.75
3.5	2.250	N/A	N/A
4.0	1.125	48.49	48.49
4.0	1.500	N/A	N/A
4.0	2.250	N/A	N/A
4.8	1.125	N/A	N/A
4.8	1.500	N/A	N/A
4.8	2.250	N/A	N/A

(1) Maximum vertical load per wall height and wind load of given magnitude for each load duration.

ANNEX 2 Design load tables for Kingspan TEK 142 and TEK 172 wall and roof panels (continued)

Table 4 TEK 142 roof — vertical load capacity[1]

Span on slope	Horizontal span	Pitch	Vertical load capacity (kN·m^{-2})			
			Duration			
			Permanent[2]	Long-term[2]	Medium-term[2]	Short-term[3]/ instantaneous
(m)	(m)	(°)				
1.5	1.48	10	1.515	3.076	4.615	5.967
1.5	1.36	25	1.646	3.632	5.449	5.967
1.5	1.06	45	2.110	5.967	8.951	5.967
2.0	1.97	10	1.136	2.307	3.461	4.476
2.0	1.81	25	1.235	2.724	4.087	4.476
2.0	1.41	45	1.582	4.476	6.713	4.476
2.5	2.46	10	0.909	1.846	2.769	3.580
2.5	2.27	25	0.988	2.179	3.269	3.580
2.5	1.77	45	1.266	3.580	5.371	3.580
3.0	2.95	10	0.757	1.538	2.307	2.984
3.0	2.72	25	0.823	1.816	2.724	2.984
3.0	2.12	45	1.055	2.984	4.476	2.984
3.5	3.45	10	0.649	1.318	1.975	2.557
3.5	3.17	25	0.705	1.557	2.285	2.557
3.5	2.47	45	0.894	2.469	3.619	2.557

(1) Maximum vertical design load per roof span and pitch for each load duration.

(2) Load applied vertically on plan.

(3) Load applied perpendicular to pitch.

Table 5 TEK 142 panel properties — stiffness

Flexural characteristic		Shear characteristic	
Rigidity *EI* (GPa)	Deflection factor $k_{def,(EI)}$	Rigidity *GA* (kN)	Deflection factor $k_{def,(GA)}$
459.7	1.87	569.9	6.45

Table 6 TEK 142 racking resistance[1] *— nail spacing 75 mm*

Height *H*	Fixing nail[2][3]		Racking load[4] (kN·m^{-1})		Stiffness[5]
			Load duration		
(m)	Diameter (mm)	Spacing (mm)	Short-term	Instantaneous	(kN·m^{-1})
2.4	2.8	75	8.89	10.86	1055.40
2.7	2.8	75	8.89	10.86	896.67
3.0	2.8	75	8.89	10.86	770.67
3.5	2.8	75	8.89	10.86	612.03
4.0	2.8	75	8.89	10.86	497.32
4.8	2.8	75	8.89	10.86	370.62

(1) Racking resistance is influenced by the spacing of fixing nails at the perimeter (minimum 50 mm, maximum 150 mm). The racking resistance for other nail spacings can be calculated — the Certificate holder's advice should be sought.

(2) The fixing spacing factor (k_s) is included, but the wall shape factor (k_d) and the load factor (k_q) must be applied to the strength values.

(3) Dimensions given relate to machine-driven nails with tensile strength of 700 N·mm^{-2}. The capacity of other fixings can be calculated in accordance with BS EN 1995-1-1: 2004, Method B.

(4) Maximum racking load for each wall height — without vertical load.

(5) Values based on a panel 1220 mm wide.

ANNEX 2 Design load tables for Kingspan TEK 142 and TEK 172 wall and roof panels (continued)

Table 7 TEK 142 racking resistance[1] — nail spacing 150 mm

Height *H*	Fixing nail[2][3]		Racking load[4] (kN·m^{-1})		Stiffness[5]
			Load duration		
(m)	Diameter (mm)	Spacing (mm)	Short-term	Instantaneous	(kN·m^{-1}·m^{-1})
2.4	2.8	150	5.58	6.82	747.83
2.7	2.8	150	5.58	6.82	650.52
3.0	2.8	150	5.58	6.82	570.82
3.5	2.8	150	5.58	6.82	466.85
4.0	2.8	150	5.58	6.82	388.69
4.8	2.8	150	5.58	6.82	298.84

(1) Racking resistance is influenced by the spacing of fixing nails at the perimeter (minimum 50 mm, maximum 150 mm). The racking resistance for other nail spacings can be calculated — the Certificate holder's advice should be sought.

(2) The fixing spacing factor (k_s) is included, but the wall shape factor (k_d) and the load factor (k_q) must be applied to the strength values.

(3) Dimensions given relate to machine-driven nails with tensile strength of 700 N·mm^{-2}. The capacity of other fixings can be calculated in accordance with BS EN 1995-1-1: 2004, Method B.

(4) Maximum racking load for each wall height — without vertical load.

(5) Values based on a panel 1220 mm wide.

Table 8 TEK 172 wall — vertical load capacity[1]

Height *H*	Vertical load capacity[2] (kN·m^{-1})				
	Load duration				
(m)	Permanent	Long-term	Medium-term	Short-term	Instantaneous
2.4	17.886	36.072	44.869	50.477	60.674
2.7	17.084	34.454	44.869	50.477	60.674
3.0	16.269	32.808	44.869	50.477	60.674
3.5	14.916	30.078	42.110	50.477	60.674
4.0	13.612	27.444	38.422	50.477	60.674
4.8	11.693	23.570	32.998	50.477	60.674

(1) Without horizontal load.

(2) Maximum vertical load per wall height for each load duration.

Table 9 TEK 172 wall — horizontal load capacity[1]

Height *H*	Horizontal load capacity[2] (kN·m^{-1})	
	Load duration	
(m)	Short-term	Instantaneous
2.4	5.50	5.50
2.7	4.49	4.49
3.0	3.71	3.71
3.5	2.75	2.75
4.0	2.08	2.08
4.8	1.38	1.38

(1) Without vertical load, ie as an infill wall.

(2) Maximum wind load for each wall height.

ANNEX 2 Design load tables for Kingspan TEK 142 and TEK 172 wall and roof panels (continued)

Table 10 TEK 172 wall — combined vertical and horizontal load capacity[1]

Height H	Applied horizontal load ($kN \cdot m^{-2}$)	Vertical load capacity ($kN \cdot m^{-1}$)	
	Duration		
(m)	Instantaneous	Short-term	Instantaneous
2.4	1.125	50.48	60.67
2.4	1.500	50.48	60.67
2.4	2.250	50.48	60.67
2.7	1.125	50.48	60.67
2.7	1.500	50.48	60.67
2.7	2.250	50.48	57.81
3.0	1.125	50.48	60.67
3.0	1.500	50.48	60.67
3.0	2.250	50.48	51.68
3.5	1.125	50.48	60.67
3.5	1.500	50.48	54.66
3.5	2.250	40.03	40.03
4.0	1.125	50.48	55.26
4.0	1.500	45.71	45.70
4.0	2.250	N/A	N/A
4.8	1.125	42.66	42.65
4.8	1.500	N/A	N/A
4.8	2.250	N/A	N/A

(1) Maximum vertical load per wall height and wind load of given magnitude for each load duration.

Table 11 TEK 172 roof — vertical load capacity[1]

Span on slope	Horizontal span	Pitch	Vertical load capacity ($kN \cdot m^{-2}$)			
			Duration			
(m)	(m)	(°)	Permanent[2]	Long-term[2]	Medium-term[2]	Short-term[3]/ instantaneous
1.5	1.48	10	1.515	3.076	4.615	5.967
1.5	1.36	25	1.646	3.632	5.449	5.967
1.5	1.06	45	2.110	5.967	8.951	5.967
2.0	1.97	10	1.136	2.307	3.461	4.476
2.0	1.81	25	1.235	2.724	4.087	4.476
2.0	1.41	45	1.582	4.476	6.713	4.476
2.5	2.46	10	0.909	1.846	2.769	3.580
2.5	2.27	25	0.988	2.179	3.269	3.580
2.5	1.77	45	1.266	3.580	5.371	3.580
3.0	2.95	10	0.757	1.538	2.307	2.984
3.0	2.72	25	0.823	1.816	2.724	2.984
3.0	2.12	45	1.055	2.984	4.476	2.984
3.5	3.45	10	0.649	1.318	1.978	2.557
3.5	3.17	25	0.705	1.557	2.335	2.557
3.5	2.47	45	0.904	2.557	3.836	2.557

(1) Maximum vertical design load per roof span and pitch for each load duration.
(2) Load applied vertically on plan.
(3) Load applied perpendicular to pitch.

Table 12 TEK 172 panel properties — stiffness

Flexural characteristic		Shear characteristic	
Rigidity EI (GPa)	Deflection factor $k_{def,(EI)}$	Rigidity GA (kN)	Deflection factor $k_{def,(GA)}$
702.5	1.87	688.5	6.46

ANNEX 2 Design load tables for Kingspan TEK 142 and TEK 172 wall and roof panels (continued)

Table 13 TEK 172 racking resistance[1] — 75 mm nail spacing

Height H (m)	Fixing nail[2][3] Diameter (mm)	Fixing nail[2][3] Spacing (mm)	Racking load[4] (kN·m^{-1}) Load duration: Short-term	Racking load[4] (kN·m^{-1}) Load duration: Instantaneous	Stiffness[5] (kN·m^{-1}·m^{-1})
2.4	2.8	75	8.89	10.86	1055.40
2.7	2.8	75	8.89	10.86	896.67
3.0	2.8	75	8.89	10.86	770.67
3.5	2.8	75	8.89	10.86	612.03
4.0	2.8	75	8.89	10.86	497.32
4.8	2.8	75	8.89	10.86	370.62

(1) Racking resistance is influenced by the spacing of fixing nails at the perimeter (minimum 50 mm, maximum 150 mm). The racking resistance for other nail spacings can be calculated — the Certificate holder's advice should be sought.
(2) The fixing spacing factor (k_s) is included, but the wall shape factor (k_d) and the load factor (k_q) must be applied to the strength values.
(3) Dimensions given relate to machine-driven nails with tensile strength of 700 N·mm^{-2}. The capacity of other fixings can be calculated in accordance with BS EN 1995-1-1: 2004, Method B.
(4) Maximum racking load for each wall height — without vertical load.
(5) Values based on a panel 1220 mm wide.

Table 14 TEK 172 racking resistance[1] — 150 mm nail spacing

Height H (m)	Fixing nail[2][3] Diameter (mm)	Fixing nail[2][3] Spacing (mm)	Racking load[4] (kN·m^{-1}) Load duration: Short-term	Racking load[4] (kN·m^{-1}) Load duration: Instantaneous	Stiffness[5] (kN·m^{-1}·m^{-1})
2.4	2.8	150	5.58	6.82	747.83
2.7	2.8	150	5.58	6.82	650.52
3.0	2.8	150	5.58	6.82	570.82
3.5	2.8	150	5.58	6.82	466.85
4.0	2.8	150	5.58	6.82	388.69
4.8	2.8	150	5.58	6.82	298.84

(1) Racking resistance is influenced by the spacing of fixing nails at the perimeter (minimum 50 mm, maximum 150 mm). The racking resistance for other nail spacings can be calculated — the Certificate holder's advice should be sought.
(2) The fixing spacing factor (k_s) is included, but the wall shape factor (k_d) and the load factor (k_q) must be applied to the strength values.
(3) Dimensions given relate to machine-driven nails with tensile strength of 700 N·mm^{-2}. The capacity of other fixings can be calculated in accordance with BS EN 1995-1-1: 2004, Method B.
(4) Maximum racking load for each wall height — without vertical load.
(5) Values based on a panel 1220 mm wide.

ANNEX 3 THERMAL DATA

The thermal conductivities (λ value) given in Table 1 may be used to conduct thermal transmittance (U value) calculations in accordance with EN ISO 6946 : 2007.

Table 1 Thermal conductivity of associated materials

Material	λ value (W·m^{-1}·K^{-1})
plasterboard	0.25
timber	0.13
PUR insulation[1]	0.023[2]
OSB/3	0.13

(1) Rigid urethane insulation.
(2) This value is assessed in accordance with EN 12667 : 2001 and aged in accordance with EN 13165 : 2008.

British Board of Agrément
Bucknalls Lane, Garston, Watford, Hertfordshire WD25 9BA
Tel: + 44 (0) 1923 665300 Fax: + 44 (0) 1923 665301
e-mail: mail@bba.star.co.uk website: www.bbacerts.co.uk