



# Kingspan **TEK**® Building System

## SPECIFICATION MANUAL



*Low Energy –  
Low Carbon Buildings*

# Contents

	Page
<hr/>	
Introduction	
Structural Insulated Panel Technology	3
The <i>Kingspan TEK</i> ® Building System Applications	4
Environmental Sustainability at its Core Fast, Cost Effective & Predictable	5
Project Gallery	6 – 8
<hr/>	
Typical Construction and U-values	
Assumptions	9
<hr/>	
Design Considerations	
Design Flexibility	12
Specification Clause	12
NBS Specifications	12
Water Vapour Control	12
External Walls & Roofs	13
Internal / Partition Walls	14
Separating Walls (Party Walls)	14
Fire Stops	15
Ventilation	15
Heating Systems	16
Technical Support	16
Habitable Roof Space	17
Floor Space	18
Environmental Sustainability	19
Zero ODP and Low GWP	19
U-values	19
Air-tightness	19
Limited Cold Bridging	20
Passivhaus Design	21
Environmental Impact & Responsible Sourcing	23
BREEAM & The Code for Sustainable Homes	24
Sustainability & Responsibility	24
Less Transport	24
Minimal Landfill	24
<hr/>	
Financial Advantages	
Energy Savings	25
Capital Cost Savings	25
Landfill Savings	25
Labour Savings	25
Opens Doors Faster	25
<hr/>	
Delivery Partners	
Delivery Partners	26
<hr/>	
Sitework	
Supply and Erect	27
Joining <i>Kingspan TEK</i> ® Building System Panels	27
Lifting Panels	27
Delivery of the <i>Kingspan TEK</i> ® Building System	27
Storage of Components	27
Alterations to the <i>Kingspan TEK</i> ® Building System	27
Water Ingress During Construction	28
Fixing Items to <i>Kingspan TEK</i> ® Building System Walls	28
Services Installation	28
<hr/>	
<i>Kingspan TEK</i> ® Building System Panel Details	
The Facings	29
The Core	29
Standards and Approvals	29
Structural Dimensions	29
Water Vapour Resistance	29
Durability	29
Resistance to Solvents, Fungi and Rodents	29
Strength & Stability	29
Fire Performance	30
Resistance to Airborne Sound	30
Thermal Properties	30



# Introduction



## Structural Insulated Panel Technology

Timber, worldwide, is traditionally the most widely used building material. It is easy to handle, natural and brings flexibility to design.

Today, many buildings are built with a traditional timber frame structure and this trend is growing as Building Regulations / Standards strive for better thermal performance and the construction industry increasingly moves towards faster and lighter methods of construction.

Structural Insulated Panel (SIP) technology is the next generation of timber based construction.

In the UK and Ireland, demand for construction methods such as SIPs is growing rapidly. This is being driven by factors such as, the availability of on-site skills being at an all time low.

Building Regulations / Standards are demanding much higher levels of energy efficiency. This is challenging many traditional construction systems and, in some instances, forcing people to look at alternative ways of meeting the requirements more economically. Unparalleled energy efficiency combined with high build-speed and the low site wastage make the *Kingspan TEK*® Building System a very cost effective way of achieving and exceeding the thermal requirements of the Building Regulations / Standards.

# Introduction

## The *Kingspan TEK*® Building System

The *Kingspan TEK*® Building System comprises 142 mm thick structural insulated panels (SIPs) connected with a unique jointing system for walls and roofs, and intermediate floors using I-beams or open web joists.

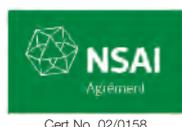
*Kingspan TEK*® Building System panels consist of a high performance rigid urethane insulation core, sandwiched between two layers of Oriented Strand Board type 3 (OSB/3). During manufacture, the insulation core of *Kingspan TEK*® Building System panels is autohesively bonded to the OSB/3 facings. This process provides a more reliable and superior adhesion than the traditional secondary bonding process used in the manufacture of most other SIPs.

*Kingspan TEK*® Building System panels are a structural composite. This composite assembly provides stiffness, strength and predictable responses to applied loads.

The *Kingspan TEK*® Building System is recognised by major building warranty providers such as NHBC, Building Life Plans, Premier, Build Zone Homebond and HAPM.

If a building guarantee is required, then guidance should be sought from the organisation offering the guarantee. Typically, third party independent certification would be required e.g. BBA or NSAI Agrément certification.

The *Kingspan TEK*® Building System holds BBA and NSAI Agrément certification.



## Applications

The *Kingspan TEK*® Building System can be used to create buildings up to 4 storeys. The panels are lightweight compared with brick and block, at a maximum of 25 kg/m<sup>2</sup>. The lightweight nature of the *Kingspan TEK*® Building System panels means that they may be ideal for use where heavy construction are not possible e.g. where soil conditions are unfavourable, or foundation depth restricted.

Buildings constructed with the *Kingspan TEK*® Building System can have extremely low levels of energy use. As a result, the *Kingspan TEK*® Building System can be the perfect high performance building fabric solution for Passivhaus design, and has been an integral component of delivering several Code for Sustainable Homes Level 5 and Level 6 developments.

As with all construction methods, including traditional masonry, a long lasting external weather proofing is also a necessary part of the *Kingspan TEK*® Building System.

*NB: The System is not recommended for cellars or basement constructions or for use in high humidity environments.*



## Environmental Sustainability at its Core

- Can be used to create highly energy efficient buildings.
- Can achieve whole wall and roof U-values of 0.20 – 0.10 W/m<sup>2</sup>·K or better.
- Can achieve air leakage rates as good as 0.08 air changes per hour at normal pressures (approximately 1 m<sup>3</sup>/hour/m<sup>2</sup> at 50 Pa).
- Creates minimal site waste, as kits are designed, cut and palletised in a quality controlled, factory environment.
- All the components for a typical *Kingspan TEK*<sup>®</sup> Building System kit, e.g. panels and ancillaries, come from one source, therefore there are fewer deliveries, less transport, congestion, noise and traffic pollution, which reduces a project's impact on the environment.
- The OSB facing of *Kingspan TEK*<sup>®</sup> Building System panels is PEFC Chain of Custody certified at 70%.
- Wall and roof elements, constructed using the *Kingspan TEK*<sup>®</sup> Building System, correspond to generic elements with 2008 BRE Global Green Guide Summary Ratings of A+ or A.
- The insulation core of the panels is manufactured with a blowing agent that has zero Ozone Depletion Potential (ODP) and low Global Warming Potential (GWP).



## Fast, Cost Effective & Predictable

- The panelised nature of the System can enable a fast track building process, which can help to reduce construction time.
- Follow on trades can start work sooner, as once a *Kingspan TEK*<sup>®</sup> Building System kit is erected and wrapped with a breathable membrane (e.g. *Kingspan nilvent*<sup>®</sup>), the shell is weather-tight, and this can help the contractor complete the project more quickly.
- Much easier to predict project completion times, as the System is relatively simple to erect and requires no wet trades or brick layers.
- Defects are vastly reduced due to factory controlled manufacturing, precise engineering and the design of the System.

## Innovative

- Can provide a more controllable indoor environment than traditional construction methods, such as masonry, due to the System's potential for superior air-tightness.
- First SIP building system in the UK and Ireland to receive BBA and NSAI Agreement certification.
- Used on the UK's first house to achieve Code for Sustainable Homes – Level 6 (BRE Innovation Centre 2007).
- Has since been used on several multiple dwelling projects that have achieved Code for Sustainable Homes Level 5 and Level 6.

# Project Gallery

## Multiple Residential - Private & Social

The *Kingspan TEK*® Building System has been widely used across the UK and Ireland by major developers, house builders and housing associations to construct multiple residential dwellings. To these clients the System offers a range of unique advantages, including: speed of construction; predictable completion dates; less on-site labour and the provision of a weather-tight shell.



Gainsborough, Lincolnshire



Beswick, Manchester



Rackheath, Norfolk



Chelmsford, Essex



Silsden, West Yorkshire



Huntingdon, Cambridgeshire

## Education & Healthcare

Public Sector buildings are increasingly required to meet a standard of construction above and beyond those set out in the Building Regulations. By demanding low U-values and low long term running costs the Public Sector seeks to ensure that the buildings they commission offer not only the best value for money, but also deliver industry best practice in respect of environmental and socio-economic responsibility.



The Oaks Day Nursery, Kent



John Warner School, Hertfordshire



St. Catherine's Hospice, North Yorkshire



All Saints Primary School, Kent



Weeting Primary School, Suffolk



William Penn Nursery, Berkshire

# Project Gallery

## Private Residential

The *Kingspan TEK*® Building System has long proved popular with those self-builders who demand the best possible construction techniques for their new home. By offering a super insulated structure, with very low fuel bills, additional room space and a quick and predictable build programme the *Kingspan TEK*® Building System meets their exacting standards and is recognised by a range of industry bodies.



Oxford, Oxfordshire



Middle Barton, Oxfordshire



Sheffield, South Yorkshire



Lavenham, Suffolk



Sea View Villa Dorset



Clane, County Kildare

# Typical Constructions and U-values

## Assumptions

The U-values in the tables that follow have been calculated, under a management system certified to the BBA Scheme for Assessing the Competency of Persons to Undertake U-value and Condensation Risk Calculations, using the method detailed in BS / I.S. EN ISO 6946: 2007 (Building components and building elements. Thermal resistance and thermal transmittance. Calculation method) and using the conventions set out in BR443 "Conventions for U-value calculations".



The U-values in the tables that follow are valid for the constructions shown in the details immediately above. Unless otherwise stated, the U-values quoted are based on an internal construction comprising a 3 mm plaster skim on 12.5 mm plasterboard fixed to 50 x 25 mm softwood timber battens. The external finishes are as specified in the examples themselves.

*NB: For calculations which do not feature additional internal insulation, a 4% bridging factor has been assumed for walls and 1% for pitched roofs. The thermal conductivity of the timber has been assumed at 0.12 W/m.K.*

*NB: Calculations assume that the use of a foil faced breather membrane yields an airspace thermal resistance of 0.54 m<sup>2</sup>.K/W.*

*NB: For the purposes of these calculations the standard of workmanship has been assumed good and therefore the correction factor for air gaps has been ignored.*

*NB: The figures quoted are for guidance only. A detailed U-value calculation together with condensation risk analysis should be completed for each individual project.*

*NB: If your construction is any different to those specified and / or to gain a comprehensive U-value calculation along with a condensation risk analysis of your project please consult the Kingspan Insulation Technical Service Department for assistance (see rear cover).*

## Kingspan TEK® Building System Walls with 102.5 mm Brickwork Outer Leaf

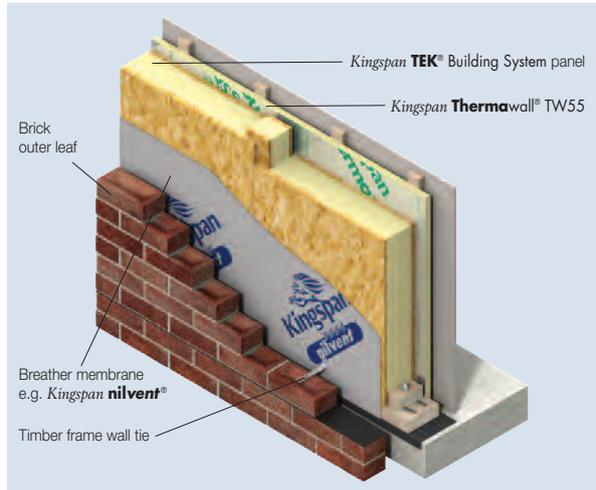


Figure 1

### U-values (W/m<sup>2</sup>.K) for Kingspan TEK® Building System Walls with Various Thicknesses of Additional Insulation and Different Breathable Membranes

Thickness of Kingspan TEK® Building System Panels (mm)	Thickness of Kingspan Thermawall® (mm)	U-value	
		Standard Breathable Membrane	Foil Faced Breathable Membrane
142	0	0.19	0.18
142	20	0.15	0.14
142	25	0.15	0.14
142	30	0.14	0.13
142	40	0.13	0.13
142	50	0.12	0.12
142	60	0.12	0.11
142	70	0.11	0.11
142	75	0.11	0.10
142	80	0.11	0.10
142	90	0.10	0.10

# Typical Constructions and U-values

## Kingspan **TEK**® Building System Walls with 10 mm Polymer Rendered 100 mm Dense Blockwork Outer Leaf\*

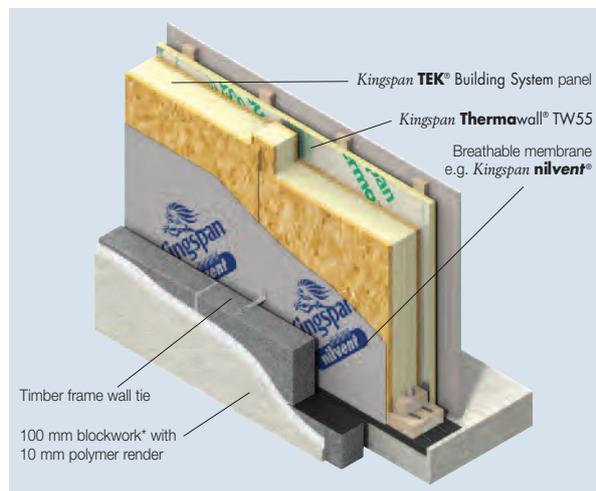


Figure 2

## Kingspan **TEK**® Building System Wall Panels with Ventilated Cladding

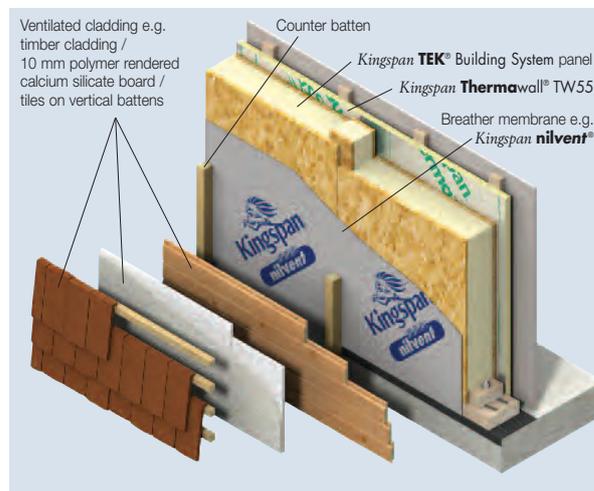


Figure 3

U-values (W/m<sup>2</sup>·K) for Kingspan **TEK**® Building System Walls with Various Thicknesses of Additional Insulation and Different Breathable Membranes

Thickness of Kingspan <b>TEK</b> ® Building System Panels (mm)	Thickness of Kingspan <b>Thermawall</b> ® (mm)	U-value	
		Standard Breathable Membrane	Foil Faced Breathable Membrane
142	0	0.19	0.17
142	20	0.15	0.14
142	25	0.14	0.14
142	30	0.14	0.13
142	40	0.13	0.13
142	50	0.12	0.12
142	60	0.12	0.11
142	70	0.11	0.11
142	75	0.11	0.10
142	80	0.11	0.10
142	90	0.10	0.10

\* Calculations assume Dense Block of  $\lambda$ -value 1.13 W/m·K

U-values (W/m<sup>2</sup>·K) for Kingspan **TEK**® Building System Walls with Various Thicknesses of Additional Insulation

Thickness of Kingspan <b>TEK</b> ® Building System Panels (mm)	Thickness of Kingspan <b>Thermawall</b> ® (mm)	U-value
142	0	0.20
142	20	0.16
142	25	0.15
142	30	0.15
142	40	0.14
142	50	0.13
142	60	0.12
142	70	0.11
142	75	0.11
142	80	0.11
142	90	0.10

**Kingspan TEK® Building System Pitched Roofs**

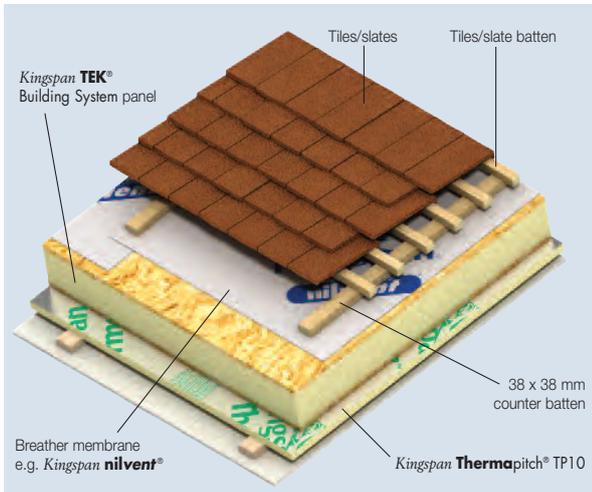


Figure 4

U-values (W/m<sup>2</sup>·K) for Kingspan TEK® Building System Roofs with Various Thicknesses of Additional Insulation

Thickness of Kingspan TEK® Building System Panels (mm)	Thickness of Kingspan Thermapitch® TP10 (mm)	U-value
142	0	0.19
142	20	0.15
142	25	0.15
142	30	0.14
142	40	0.13
142	50	0.13
142	60	0.12
142	70	0.11
142	75	0.11
142	80	0.11
142	90	0.10



# Design Considerations

## Design Flexibility

The *Kingspan TEK*<sup>®</sup> Building System leaves ample scope for individual design. The panels are pre-cut to match a project's engineering and design specification, and a complete kit is delivered to site ready for erection.

The *Kingspan TEK*<sup>®</sup> Building System can be used to create the walls (loadbearing and non-loadbearing), and roofs of a complete building, up to four storeys in height.

The *Kingspan TEK*<sup>®</sup> Building System can be erected on any ground floor construction, however the foundations must have specific tolerances as per guidance available from the Kingspan Insulation Technical Services Department (see rear cover).

For further guidance on designing buildings with the *Kingspan TEK*<sup>®</sup> Building System please refer to the *Kingspan TEK*<sup>®</sup> Building System Standard Details, available for download from [www.kingspantek.co.uk/literature](http://www.kingspantek.co.uk/literature) or contact the Kingspan Insulation Technical Services Department (see rear cover).

The performance characteristics of buildings constructed from the *Kingspan TEK*<sup>®</sup> Building System quoted in this document are predicated on its use as a full System i.e. incorporating walls and roof built with *Kingspan TEK*<sup>®</sup> Building System panels. *Kingspan TEK*<sup>®</sup> Building System roof and wall elements can be used individually with other non-*Kingspan TEK*<sup>®</sup> Building System components. For example *Kingspan TEK*<sup>®</sup> Building System panels can be used as a roofing system in conjunction with masonry or timber frame walls, and *Kingspan TEK*<sup>®</sup> Building System wall panels can be used in conjunction with a traditional truss rafter roof. For further guidance on the performance characteristics of *Kingspan TEK*<sup>®</sup> Building System panels used in conjunction with other construction components please contact the Kingspan Insulation Technical Services Department (see rear cover).

## Specification Clause

The *Kingspan TEK*<sup>®</sup> Building System should be described in specifications as:-

The walls and / or roof shall be constructed from 142 mm thick *Kingspan TEK*<sup>®</sup> Building System panels comprising a high performance rigid urethane insulation core, sandwiched between two layers of PEFC Chain of Custody certified Oriented Strand Board type 3 (OSB/3) autohesively bonded to the insulation core during manufacture. The product shall be manufactured: with a blowing agent that has zero Ozone Depletion Potential (ODP) and low Global Warming Potential (GWP); under a management system certified to BS EN ISO 9001: 2008, BS EN ISO 14001: 2004 and BS OHSAS 18001: 2007; by Kingspan Insulation Limited; and installed in accordance with the instructions issued by them.

## NBS Specifications

Details also available in NBS Plus.

NBS users should refer to clause(s):

B14 110 (Standard and Intermediate)



## Water Vapour Control

Consideration should be given to the risk of condensation when designing thermal elements.

Condensation can be controlled in buildings constructed with the *Kingspan TEK*<sup>®</sup> Building System by ensuring the panels are properly installed in accordance with Kingspan Insulation Ltd's guidance, and a fully integrated and operating mechanical ventilation system is incorporated within the building design. Provided these directions are followed, interstitial condensation under normal domestic conditions should be minimised and no vapour control layer is required.

Notwithstanding this, a condensation risk analysis should be carried out for all projects following the procedures set out in BS 5250: 2002 (Code of practice for the control of condensation in buildings). The Kingspan Insulation Technical Service Department (see rear cover) can provide this service.

If a condensation risk is predicted, it can be controlled, by ensuring there is a layer of high vapour resistance on the warm side of the insulation layer. If required, the vapour resistance of the wall lining can be increased by the use of a vapour check plasterboard\*; the use of *Kingspan Thermapitch*<sup>®</sup> TP10 or *Thermawall*<sup>®</sup> TW55, both of which contain an integral vapour control layer\*; the use of a layer of polythene sheeting\*; or by the application of two coats of Gyproc Drywall Sealer to the plasterboard lining.

\* With appropriate detailing at joints, penetrations and wall perimeters.

NB: The System is not recommended for cellars or basement constructions, or for use in high humidity environments.

## External Walls & Roofs

### Internal Lining

All **Kingspan TEK® Building System** panels should be lined internally with plasterboard. The minimum plasterboard requirement may vary subject to statutory requirements for fire and acoustics. Please consult the Kingspan Insulation Technical Services Department (see rear cover) for definitive guidance on your construction.

Where services need to be fixed on an external **Kingspan TEK® Building System** wall or roof there are two options for creating a service cavity:

- a single layer of min. 12.5 mm plasterboard on min. 25 mm deep by 50 mm wide vertical timber battens (see Figure 5); or
- a double layer of 12.5 mm plasterboard – the layer closest to the **Kingspan TEK® Building System** panel should be chased out to create a cavity for services. The second layer should be 12.5 mm vapour check plasterboard (see Figure 6).

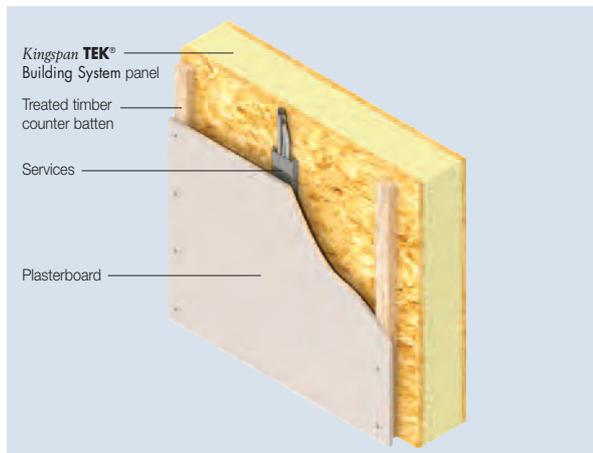


Figure 5

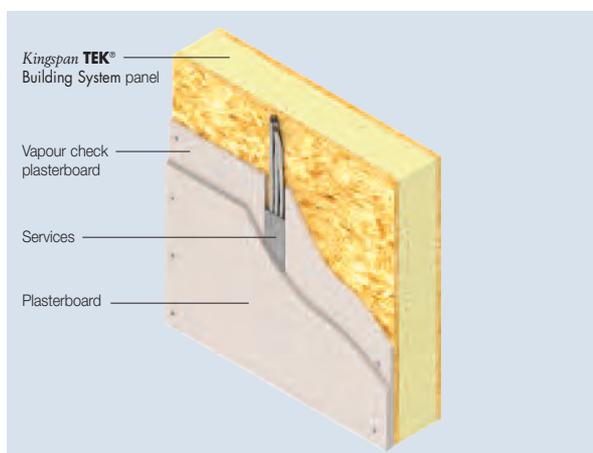


Figure 6

Where services need to be fixed and there is an additional layer of insulation, e.g. **Kingspan Thermawall® TW55**, fixed to the inside of the **Kingspan TEK® Building System** panels, a service cavity can be created by installing a single layer of min. 12.5 mm plasterboard on min. 25 mm deep by 50 mm wide vertical timber battens (see Figure 7).

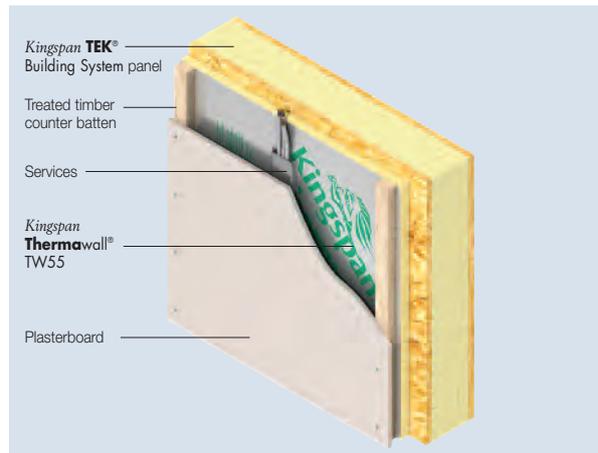


Figure 7

In all cases the need for electrical sheathing / conduit should be assessed in accordance with Building Regulations / Standards and BS 7671: 2001 (Requirements for Electrical Installations).

Where an electrical back box must be fixed to a **Kingspan TEK® Building System** wall or roof, the electrical back box must be either surface mounted, or the service cavity must be sufficiently wide to accommodate a flush fitting electrical back box. Under no circumstances should the OSB/3 facing and / or the insulation core of the **Kingspan TEK® Building System** panels, or any internal insulation, be 'chased out' to accommodate service fittings.

Where cabled services do not need to be fixed to the **Kingspan TEK® Building System** panel, a single layer of min. 12.5 mm plasterboard can be fixed direct to the panel (see Figure 8).

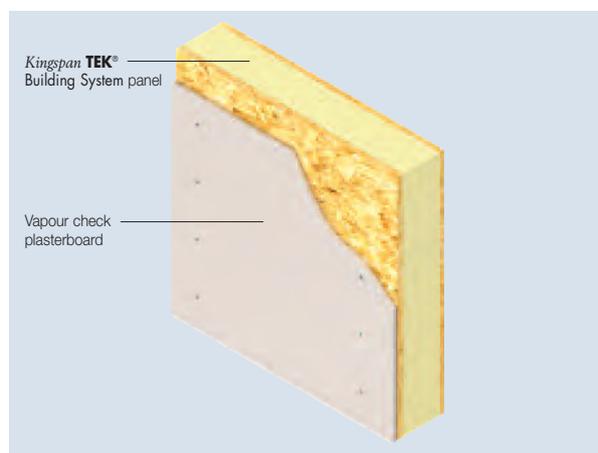


Figure 8

# Design Considerations

## External Cladding – Walls

As soon as possible after *Kingspan TEK® Building System* walls have been erected, a breathable membrane, e.g. *Kingspan nilvent®*, should be fixed directly to the panels. External cladding should be installed over the breathable membrane.

The following are examples of external cladding for walls constructed using the *Kingspan TEK® Building System*:

- outer leaf of brickwork / stone, ensuring a minimum 50 mm cavity is maintained between the breather membrane and the brickwork;
- lightweight render coating carried on calcium silicate board which is supported by min. 25 mm deep by 50 mm wide vertical treated timber counter battens;
- feather edge timber boarding on min. 25 mm deep by 50 mm wide vertical treated timber counter battens;
- wall tiling mounted on tiling battens which are supported by min. 25 mm deep by 50 mm wide treated timber counter battens; and
- proprietary brick slip system supported by min. 25 mm deep by 50 mm wide vertical treated timber counter battens.

Other wall cladding options are possible, if you have any queries regarding the suitability of your wall cladding, please contact the Kingspan Insulation Technical Services Department (see rear cover).

## External Cladding – Roofs

As soon as possible after *Kingspan TEK® Building System* roofs have been erected, a breathable membrane, e.g. *Kingspan nilvent®*, should be fixed directly to the panels. External cladding should be installed over the breathable membrane.

The following are examples of external cladding for roofs constructed using the *Kingspan TEK® Building System*:

- tiles on tiling battens;
- slates on slate battens; or
- profiled metal sheeting onto horizontal battens.\*

All roof cladding options should be supported by 38 mm x 50 mm vertical treated timber counter battens.

If other cladding options are being considered contact the Kingspan Insulation Technical Services Department.

The roof cladding option should be decided upon at the earliest opportunity, as loading design values must be calculated when designing your project in the *Kingspan TEK® Building System*.

\* The need for battens may be negated with the use of a suitable breathable underlay.

## Internal / Partition Walls

Internal / partition walls are typically supplied as kiln dried timber stud components. Internal / partition walls can also be built from other components e.g. steel frame, *Kingspan TEK® Building System* panels.

Where cabled services are required, it is recommended that they be fixed into a timber or steel stud wall. However, where cabled services need to be fixed to an internal wall that is constructed from *Kingspan TEK® Building System* wall panels please follow the directions given in 'External Walls – Internal Cladding'.

Where cabled services do not need to be fixed to the *Kingspan TEK® Building System* wall panel, a single layer of 12.5 mm plasterboard can be fixed direct to the wall panel.

## Separating Walls (Party Walls)

### Timber Frame Separating Wall

Robust Standard Details are available (see Robust Standard Details Handbook, Appendix A2, Proprietary Flanking Conditions). Typically, party walls are manufactured from kiln dried timber stud components. Both timber frame wall panels that form the separating wall should be lined internally with (in order of application):

- one layer of gypsum based board nominal 8 kg/m<sup>2</sup> on inner leaf where there is no separating floor; or
- two layers of gypsum based board nominal 8 kg/m<sup>2</sup> each of inner leaf where there is a separating floor (non-RD floor), e.g. for flats and apartments.

It is considered best practice to avoid installing services in party walls where possible. However, it is accepted that at times it is necessary to allow for electrical back boxes, cables and service ducts within the party wall. The inclusion of water and gas services in party walls should be avoided at all times. Please refer to the Robust Standard Details Handbook and / or TRADA Handbook for guidance on integrating services into timber frame party walls, available from [www.robustdetails.com](http://www.robustdetails.com) and [www.trada.co.uk](http://www.trada.co.uk) respectively.

### Kingspan TEK® Building System Separating Wall

The *Kingspan TEK® Building System* can be used to construct party walls as an alternative to timber frame. *Kingspan TEK® Building System* panels can be used as a single panel in a party wall, or alternatively the System can be used to build a double skin party wall with a cavity between the panels. For further guidance on designing *Kingspan TEK® Building System* party walls please refer to the *Kingspan TEK® Building System* Standard Details which is available for download from [www.kingspantek.co.uk/literature](http://www.kingspantek.co.uk/literature).

## Fire Stops

Current Building Regulations / Standards should be considered with regard to the requirements for, and provision of, fire stops.

## Ventilation

### The Need for Ventilation

The *Kingspan TEK*® Building System can be considerably more air-tight than conventional constructions, achieving air leakage rates as low as 0.08 air changes per hour at normal pressures when both wall and roof panels are combined.

It is widely accepted that healthy buildings require a minimum air leakage rate of 0.5 air changes per hour at normal pressures. This is typically achieved with conventional construction techniques, but may not be achieved with buildings constructed using the *Kingspan TEK*® Building System. Therefore additional ventilation may be a sensible and beneficial addition to a building constructed with the *Kingspan TEK*® Building System.

The Building Regulations / Standards encourage architects and builders to 'Build Tight, Ventilate Right'. This means controlled ventilation. Introducing controlled ventilation is considered good practice in energy efficiency terms.



### Ventilation Options

There are many different options for controlled ventilation systems in buildings. Every building has specific ventilation requirements, and these must be considered alongside the advantages and disadvantages of each ventilation system.

Mechanical Ventilation (with Heat Recovery) Systems (MVHR) typically offer the best solution for energy efficient ventilation of buildings constructed using the *Kingspan TEK*® Building System.

MVHR systems bring controlled volumes of fresh air into the building and exhaust controlled volumes of moisture laden or stale air to the outside. With the addition of heat recovery, these systems can recover heat from outgoing air to preheat the incoming air. This heat recovery can provide a large proportion of the heat required to keep a building at comfortable living temperatures. Most MVHR systems also have the provision of a by-pass to disable the heat recovery element and allow cooling in the summer months.

*NB Please refer to suppliers of MVHR equipment, for guidance on equipment sizing and the environmental and improved indoor air quality advantages associated with their systems. It is advisable to seek systems that carry third party accreditation e.g. BBA, NSAI or equivalent.*

The addition of humidity control to the mechanical ventilation system can provide an environment in which dust mites cannot thrive. This may be of benefit to some asthma sufferers.

# Design Considerations

## Heating Systems

Heating systems in buildings constructed using the *Kingspan TEK® Building System* can usually be 'down-sized' considerably, as heating demand is typically very low or negligible. This can mean a reduction in construction costs, e.g. no need to install radiators, and also a reduction in running costs, due to low heating bills.

The *Kingspan TEK® Building System* can act as a stimulus to think outside the box with regards to heating systems. What heat is lost through the fabric of the building, or through unintentional bulk air movement, can be more than compensated for by incidental gains and the introduction of a combined ventilation and heating strategy e.g. the introduction a fan coil into a mechanical ventilation with heat recovery (MVHR) unit or the use of small wood burning stove in tandem with a standard MVHR system.

Conventional heating systems can be installed into buildings constructed using the *Kingspan TEK® Building System*, but sizing and controls are important. Controls are important so as to avoid overheating, a normal domestic heating regime could cause a building constructed with the *Kingspan TEK® Building System* to overheat. The heating load requirement of a domestic building can usually be calculated from the output of SAP software programs. For further guidance please contact the Kingspan Insulation Technical Services Department (see rear cover).

Whatever heating system you chose, you should have it engineered to suit the heating demands of the *Kingspan TEK® Building System* rather than traditional construction methods and if possible install a system that is recognised or approved under Appendix Q of SAP.

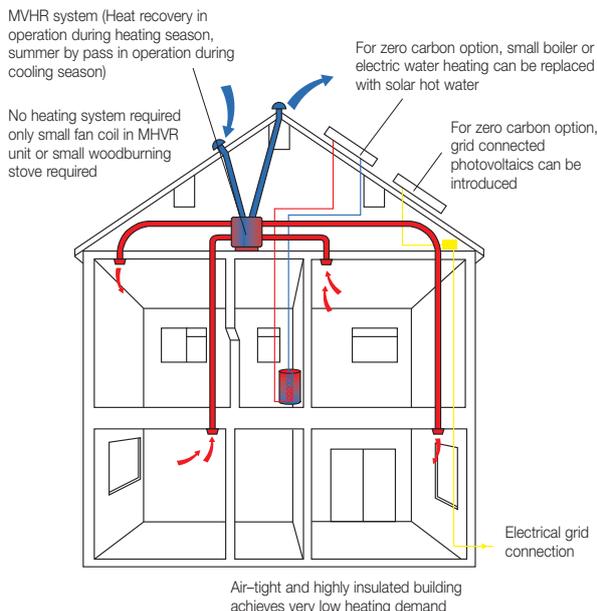


Figure 9 Heating Systems in the *Kingspan TEK® Building System*

## Technical Support

The *Kingspan TEK® Building System* is available via a network of approved Delivery Partners that are responsible for the design and erection of each specific project. A full list of approved UK, Irish and international Delivery Partners is available from the *Kingspan TEK® Building System* website (see rear cover).

The Kingspan Insulation Technical Services Department offers free advice regarding the performance and suitability of the *Kingspan TEK® Building System* for any given project.

The Kingspan Insulation Technical Services Department can also perform a wide variety of relevant calculations including: U-values\*; condensation risk analysis\*\*; SAP Ratings and Energy Performance Certificates (EPCs) in the UK; and DEAP and Building Energy Rating Certificates (BER) in the Republic of Ireland.

The department can also offer advice on subjects such as fixing, ventilation, heating systems, BREEAM ratings and Code for Sustainable Homes ratings.

Enquiries should be directed to a *Kingspan TEK® Building System* Delivery Partner for the following:

- project specific structural engineering design advice;
- to convert a drawing (including plans and elevations) into a *Kingspan TEK® Building System* design scheme; and
- quotations and lead times.

\* Calculations performed to BS / I.S. EN ISO 6946: 2007 (Building components and building elements. Thermal resistance and thermal transmittance. Calculation method) and using the conventions set out in BR443 "Conventions for U-value calculations".

\*\* Calculations performed to BS 5250: 2002 (Code of practice for control of condensation in buildings).

## Habitable Roof Space

People are driven to demand habitable roof space by various forces including:

- demands for higher housing densities and therefore reductions in footprint size (these reductions are forcing builders to build up or down to put floor area into houses); and
- the need to fully utilise all of the potential for space to accommodate changing life styles – homeowners want extra space for a home office, guest rooms, children's play rooms etc., or simply a warm storage area in the roof.

The *Kingspan TEK*® Building System is ideally suited to the creation of a room in the roof because the System's roof and wall panels can achieve U-values of as little as 0.19 W/m<sup>2</sup>·K as standard but can achieve 0.10 W/m<sup>2</sup>·K and better with extra internal insulation.

*Kingspan TEK*® Building System roof panels are manufactured up to 7.5 m long and with the use of intermediate purlins, any size of roof can be constructed with the System.



# Design Considerations

## Floor Space

When building a wall to achieve a U-value of  $0.20 \text{ W/m}^2\text{K}$  using the **Kingspan TEK® Building System**, the structure can be just 245 mm thick. In comparison, a timber frame wall to achieve the same U-value may have to be 390 mm thick, and a full fill masonry cavity wall to achieve the same U-value may have to have a wall 398 mm thick.

This means that the **Kingspan TEK® Building System** can provide more floor space for the same external dimensions.

With the **Kingspan TEK® Building System**, in the example shown below, you can achieve  $9.7 \text{ m}^2$  more useable floor space than a house built with timber frame walls and  $10.2 \text{ m}^2$  more useable floor space than a house built with masonry full fill cavity walls of the same external dimensions and U-value ( $0.20 \text{ W/m}^2\text{K}$ ).

**Kingspan TEK® Building System Wall**  
**Wall thickness 245 mm**  
 (27.5 mm brick slip / bedding compound, 10 mm calcium silicate board, 25 mm deep batten, 142 mm TEK Panel, 25 mm deep batten, 12.5 mm plasterboard, 3 mm skim)

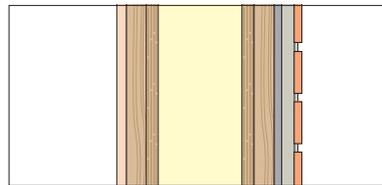
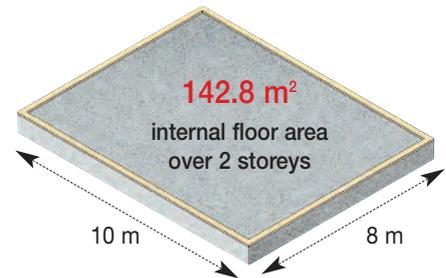


Figure 10



**Timber Frame Wall**  
**Wall thickness 390 mm**  
 (102.5 mm brick, 50 mm cavity, foil faced breather membrane, 12 mm OSB, 210 mm glass mineral fibre quilt ( $0.040 \text{ W/m}^2\text{K}$ ) between 210 mm deep studs, 12.5 mm vapour check plasterboard, 3 mm skim)

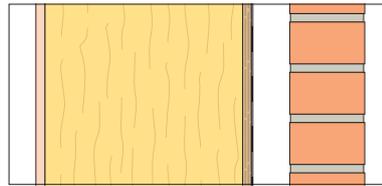
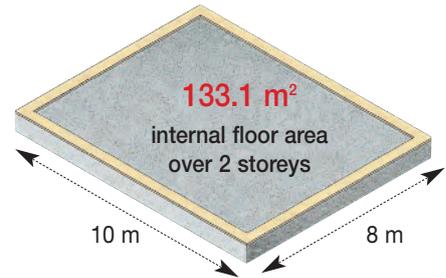


Figure 11



**Masonry Full Fill Cavity Wall**  
**Wall thickness 398 mm**  
 (102.5 mm brick, 165 mm rock mineral fibre full fill ( $0.036 \text{ W/m}^2\text{K}$ ), 100 mm dense block, 15 mm dab cavity, 12.5 mm plasterboard on dabs, 3 mm skim)

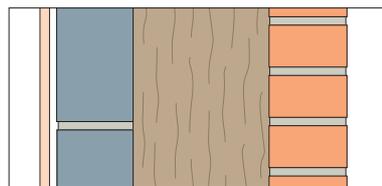
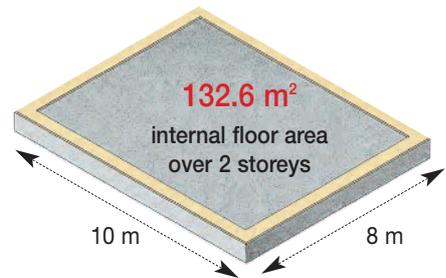


Figure 12



## Environmental Sustainability

It is widely recognised that there are four main global environmental sustainability issues: global warming, nonrenewable resource depletion, toxic pollution and ozone depletion, and that these global issues far outweigh any local environmental sustainability issues in their need for immediate attention and potential impact from inaction.

Studies have shown that the first three issues are essentially one. The extraction and consumption (burning) of fossil fuels is by far the most significant contributor to global warming, non-renewable resource depletion and toxic pollution.

In the UK 60% of fossil fuels are used to heat buildings and half of this is housing. Therefore as far as housing is concerned environmentally sustainability comes down to two main issues: reduce fossil fuel use and specify zero ODP products.

By far the most economical method of reducing fossil fuel use in housing is to reduce space-heating demand. The investment for renewable energy sources only becomes convincing once space-heating demand is minimised.

The most effective way to reduce the space-heating demand of a building is to improve the energy performance of its envelope by specifying low U-values, low air-leakage rates and by avoiding significant linear thermal bridging wherever possible.

The former has been the subject of Building Regulation for 30 years but still has a long way to go before an optimum level is attained. It is estimated that U-values of 0.10 W/m<sup>2</sup>·K would be the practical optimum.

Building Regulations / Standards are only starting to attend seriously to the issues of air-leakage and linear thermal bridging, which become more significant as U-values are reduced, but it is likely that Building Regulations / Standards will come to focus more on air-tight and better detailed constructions over the coming years as U-values and energy performance move closer to the optimum.

## Zero ODP and Low GWP

The insulation core of *Kingspan TEK*<sup>®</sup> Building System panels is manufactured with a blowing agent that has zero Ozone Depletion Potential (ODP) and low Global Warming Potential (GWP).

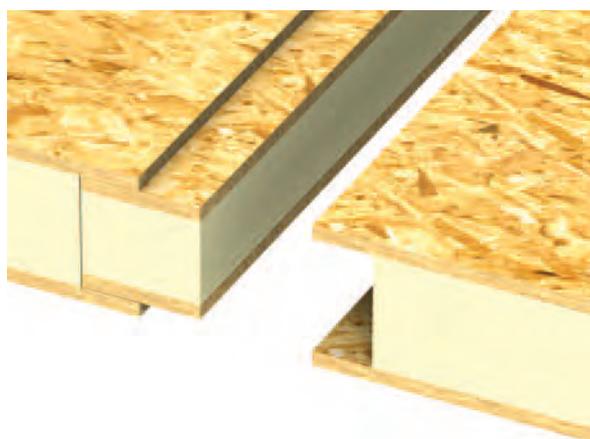
## U-values

The *Kingspan TEK*<sup>®</sup> Building System yields worst case whole wall and roof U-values of 0.20 and 0.19 W/m<sup>2</sup>·K respectively, with no additional insulation, which means that the System can meet, and exceed, current Building Regulations / Standards. The System can also meet the U-values that are expected to be set in future changes to the Building Regulations / Standards, as extremely low U-values, e.g. 0.10 W/m<sup>2</sup>·K and lower, can easily be achieved with the addition of an insulated lining, e.g. *Kingspan Thermawall*<sup>®</sup> TW55, on the inside of the *Kingspan TEK*<sup>®</sup> Building System panels. This can mean low running costs and impressive comfort for the lifetime of the building.

## Air-tightness

In addition to the excellent U-values that can be achieved by walls and roofs constructed using the *Kingspan TEK*<sup>®</sup> Building System, the closed cell structure of the rigid urethane insulation core of the panels does not allow movement of air within them. The insulation will not sag or physically deteriorate over time, as may be the case with other insulating materials.

The *Kingspan TEK*<sup>®</sup> Building System's proprietary jointing system can create a very air-tight structure. Air leakage levels can be as good as 0.08 air changes per hour at normal pressures (approximately 1 m<sup>3</sup>/hour/m<sup>2</sup> at 50 Pa).



# Design Considerations

In order to achieve these low air leakage rates for the full building envelope, care must also be taken to maintain air tightness at junctions other than those between *Kingspan TEK® Building System* panels, such as:

- air leakage at the junction of the soleplate and foundation substructure where temporary levelling shims have been used - air leakage can be minimised by ensuring the cement based mortar (e.g. EasiPoint Standard) which has been injected underneath the soleplate to distribute the load of the building has been fully installed from both sides of the soleplate;
- air leakage at intermediate floor zones can be minimised by ensuring that each connection layer between timbers, e.g. between the OSB floor decking and the timber head plate of the *Kingspan TEK® Building System* panel below, is fully sealed with silicone sealant; and
- air leakage through timber frame party walls can be minimised by the inclusion of an additional air barrier behind the plasterboard, returned 100 mm back to the flanking *Kingspan TEK® Building System* wall.

The *Kingspan TEK® Building System* does not suffer from the problems associated with other common construction techniques such as:

- air leakage through poorly sealed sockets, switches etc. in timber frame walls;
- air leakage at floor zones through wet plastered masonry cavity walls;
- air leakage under skirting boards and through poorly sealed sockets, switches etc. in dry lined masonry cavity walls; and
- air leakage through poorly sealed loft hatches and top storey ceiling light fittings.

## Limited Cold Bridging

**Repeating thermal bridges** occur where a material with a significantly worse thermal conductivity interrupts the insulation layer in a construction i.e. timber studs etc. U-value calculations for conventional timber frame systems take into account the effects of repeating thermal bridges. Guidance documents for the calculation of U-values, BS / I.S. EN ISO 6946: 2007 (Building components and building elements. Thermal resistance and thermal transmittance. Calculation method) and BR443 (Conventions for U-value calculations), indicate that in a typical domestic timber frame building, a minimum of 15% of walls and 6% of the pitched roof is un-insulated.

The percentage figures quoted include structural timbers and noggins, but do not account for timbers that are outside the wall or pitched roof area used for heat loss calculations, such as timbers around window zones, and at intermediate floors.

The insulation layer in the *Kingspan TEK® Building System* is not interrupted by repeating studwork. Therefore, there is less repeating thermal bridging, which can yield better thermal performance. There are, however, some thermal bridges, e.g. where timbers are used to support point loads etc.

The overall result is that thermal bridging from timber elements, in walls constructed using the *Kingspan TEK® Building System*, can be as low as 4%, whilst that for roofs can be as low as 1%.



**Linear thermal bridges** occur at junctions, e.g. wall to floor, and openings, e.g. windows, in the building fabric, and are expressed as psi-values ( $\psi$ ). A  $\psi$ -value is the heat loss through a junction, which is additional to the heat flow through the adjoining plane elements, and is expressed in  $W/m\cdot K$ .

$\psi$ -values are not taken into account in U-value calculations, but, instead, they are taken into account separately in the calculation methodologies used to assess the operational CO<sub>2</sub> emissions of buildings e.g. SAP in UK and DEAP in Republic of Ireland. The **Kingspan TEK® Building System** achieves very good  $\psi$ -values, due to the continuity of insulation at junctions and openings inherent in the System's design.

Kingspan Insulation has had a number of the junctions detailed in the **Kingspan TEK® Building System Standard Details Handbook** modelled and psi values calculated for them. Some of these are detailed in the table on page 23.

The column in Table 1, labelled "Basic **Kingspan TEK® Building System**", shows  $\psi$ -values for buildings constructed with the **Kingspan TEK® Building System** with no additional insulation lining the **Kingspan TEK® Building System** panels. The four columns to the right show  $\psi$ -values for constructions with additional insulation lining the **Kingspan TEK® Building System** panels. These four columns represent so-called "Enhanced Construction Details".

The **Kingspan TEK® Building System** achieves very good  $\psi$ -values, due to the continuity of insulation at junctions and openings inherent in the System's design. Many of these  $\psi$ -values are better than the values used to set the targets for compliance with Approved Document L1A to the Building Regulations for England (2013 edition). This will assist significantly in Building Regulations compliance. These  $\psi$ -values are also generally considerably better than the SAP2012 default values.

For further information and an expanded set of junctions, details and  $\psi$ -values, please contact the Kingspan Insulation Technical Services Department (see rear cover).

## Passivhaus Design

Passivhaus is a low energy building design standard developed by the Passivhaus Institute in Germany. The objective of Passivhaus is to produce buildings that provide excellent living environments for occupants, with very little energy use for heating and cooling.

The Passivhaus Standard requires:

- a maximum space heating and cooling demand of less than 15 kW-h/m<sup>2</sup>/year or a maximum heating and cooling load of 10 W/m<sup>2</sup>;
- a maximum total primary energy demand of 120 kW-h/m<sup>2</sup>/year; and
- an air change rate of no more than 0.6 air changes per hour @ 50 Pa;

To achieve the Passivhaus Standard in the UK typically involves:

- very high levels of insulation;
- extremely high performance windows with insulated frames;
- airtight building fabric;
- 'thermal bridge free' construction; and
- a mechanical ventilation system with highly efficient heat recovery

NB Information sourced from the Passivhaus Trust  
[www.passivhaustrust.org.uk](http://www.passivhaustrust.org.uk)

Passivhaus combines practical design principles with high performance products and good quality workmanship, to deliver extremely low energy buildings. This combination has made Passivhaus an increasingly popular solution with building designers.

The **Kingspan TEK® Building System** is the perfect high performance building fabric solution for Passivhaus design. The excellent thermal performance inherent in the System's building fabric can easily be supplemented and improved to meet the exacting standards required by Passivhaus standards. The factory engineering and prefabricated nature of the panels lend themselves to the meticulous attention to detail and rigorous quality standards required, as well as helping to speed up the construction process.

# Design Considerations

SAP Conventions Detail Reference	Junction Description	Default Value in SAP 2012	ADL1A 2013 Compliance Target Values	Kingspan TEK® Standard Detail Reference	Psi-value (ψ) (W/m·K)				
					Basic Kingspan TEK® Building System	Walls Lined with 20 mm of Kingspan® Thermawall® TW55*8	Walls Lined with 50 mm of Kingspan® Thermawall® TW55*8	Walls Lined with 75 mm of Kingspan® Thermawall® TW55*8	Walls Lined with 90 mm of Kingspan® Thermawall® TW55*8
E1	Steel lintel with perforated base plate and with Kingspan Koolltherm® Cavity Closer	1.00	0.05	W8	0.06	0.05	0.04	0.04	0.04
E3	Sill with Kingspan Koolltherm® Cavity Closer	0.08	0.05	W7a	0.03	0.03	0.02	0.02	0.03
E4	Jamb with Kingspan Koolltherm® Cavity Closer	0.10	0.05	W6b	0.06	0.05	0.04	0.04	0.04
E5	Concrete ground floor (U = 0.13 W/m <sup>2</sup> ·K)	0.32	0.16	W2A	0.06	0.06	0.06	0.06	0.06
E6	Intermediate timber floor within a dwelling	0.14	0.00	F4	0.10	0.10	0.10	0.10	0.10
E7	Intermediate timber floor between dwellings (in blocks of flats)	0.14	0.07	F3	0.07	0.07	0.07	0.06	0.06
E10	Loft floor at eaves*5	0.12	0.06	R10	0.06	0.05	0.04	0.03	0.03
E11	Kingspan TEK® Building System panel pitched roof at eaves	0.08	0.04	R1*1	0.09	0.09	0.09	0.09	0.09
E12	Loft floor junction with gable*5	0.48	0.06	R11	0.03	0.03	0.02	0.02	0.02
E13	Kingspan TEK® Building System panel pitched roof at verge	0.08	0.08	R12	0.04	0.03	0.02	0.02	0.02
E15	Flat roof with parapet*6	0.56	0.56	R13	0.10	0.08	0.08	0.08	0.08
E16	Wall corner (normal)	0.18	0.09	W5A Ext	0.05	0.03	0.01	0.00	0.00
E17	Wall corner (inverted – internal area greater than external area)	0.00*2	-0.09	W5A Int	-0.03	-0.03	-0.03	-0.02	-0.02
E18	Party wall between dwellings	0.12	0.06	W18A	0.04	0.04	0.03	0.03	0.03
P1	Concrete ground floor (U = 0.13 W/m <sup>2</sup> ·K)	0.16	0.08	W18D	0.08	0.08*3	0.08*3	0.08*3	0.08*3
P2	Intermediate floor within a dwelling	0.00	0.00	W18F/18G	0.00*4	0.00*4	0.00*4	0.00*4	0.00*4
P3	Intermediate floor between dwellings (in blocks of flats)	0.00	0.00	W18F/18G	0.00*4	0.00*4	0.00*4	0.00*4	0.00*4
P4	Loft floor*5	0.24	0.12	W12B	0.02	0.02*3	0.02*3	0.02*3	0.02*3
P5	Kingspan TEK® Building System panel pitched roof	0.08	0.08	W18H	0.03	0.03*3	0.03*3	0.03*3	0.03*3
R1	Head	0.08	0.08	R6a	0.09	0.07	0.07*3	0.07*3	0.07*3
R2	Sill	0.06	0.06	R6a	0.09	0.07	0.07*3	0.07*3	0.07*3
R3	Jamb	0.08	0.08	R6b	0.08	0.07	0.07*3	0.07*3	0.07*3
R4	Ridge (vaulted ceiling)	0.08	0.08	R3b	0.03	0.01	0.07*3	0.07*3	0.07*3
R5	Ridge (inverted)	0.04	0.04	R7a	-0.01	-0.02	-0.02*3	-0.02*3	-0.02*3

\*1 Junction R1 includes an intermediate floor in the junction detail.

\*2 SAP conventions document notes that there is no ACD for inverted corners and that a value of 0.00 W/m·K should be used.

\*3 Not tested – use best case tested value for this detail.

\*4 For solid and filled party walls there is no heat-loss, as no thermal bypass is possible via this route.

\*5 Insulation between and over ceiling joists and 15 mm plasterboard ceiling to achieve a U of 0.13 W/m<sup>2</sup>·K.

\*6 Warm deck flat roof with 15 mm plasterboard ceiling.

\*7 External wall assumed to be: brick outer leaf, 50 mm cavity, foil faced breather membrane, Kingspan TEK Building System panel, 12.5 mm thick plasterboard on 25 mm deep battens.

\*8 Internal insulation is installed directly against the inner surface of the Kingspan TEK Building System panel and lined with 12.5 mm thick plasterboard on 25 mm deep battens. Where the wall construction has an additional layer of insulation, the ceiling also has 25 mm of the same insulation behind the plasterboard ceiling with no airspace between.

Table 1: Psi-values (ψ) for Standard Details

## Environmental Impact & Responsible Sourcing

### Green Guide Ratings

The table below details elements constructed using the *Kingspan TEK® Building System*, the element numbers for the corresponding generic elements described in the BRE Global Green Guide, and the Summary Ratings that these generic elements achieve.

2008 BRE Green Guide Summary Ratings, for walls and roofs constructed using generic *Kingspan TEK®*-type SIPs, as a result of the comparatively low environmental impact of the SIPs, are heavily influenced by the external cladding specification. Wall and roof elements, constructed using the *Kingspan TEK® Building System*, correspond to generic elements, described in the 2008 BRE Global Green Guide, which achieve Summary Ratings of A+ or A.

The environmental impact of the insulation core of *Kingspan TEK®*-type SIPs is incorporated into the generic elemental Green Guide Summary Ratings of the walls and roofs of which the panels form the basis, because it provides a significant structural function. Therefore, the Green Guide Summary Rating of the insulation core of *Kingspan TEK®*-type SIPs can be taken as being A+ for the purposes of BREEAM.

### Responsible Sourcing

It should be noted that Kingspan Insulation only manufactures and supplies *Kingspan TEK® Building System* panels and the information below only relates to the *Kingspan TEK® Building System* panels.

The *Kingspan TEK® Building System* has *Kingspan TEK® Building System* panels at its core, but it also uses a large number of other components e.g. timber, engineered timber beams and joists, joist hangers, fixings, sealants etc. These other components are sourced and provided by the *Kingspan TEK® Delivery Partner* or its contractor. Kingspan Insulation can not provide certification for these other components and this must be sought from the *Kingspan TEK® Delivery Partner* or its contractor.

Kingspan Insulation's manufacturing facility, at which *Kingspan TEK® Building System* panels are produced, carries FSC® and PEFC Chain of Custody certification. As standard, the OSB facing of *Kingspan TEK® Building System* panels is PEFC certified at 70%. This certification verifies that, a minimum of 70% of the OSB facing of *Kingspan TEK® Building System* panels has Chain of Custody and is legally sourced.



External Wall Elements	Corresponding Ecopoint Score	Corresponding Element No.	Corresponding 2008 Green Guide Summary Rating
Brickwork, cement mortar, breather membrane, <i>Kingspan TEK® Building System</i> panels, plasterboard on battens, paint	0.42	1106164006	A+
Pre-treated softwood weatherboarding on timber battens, breather membrane, <i>Kingspan TEK® Building System</i> panels plasterboard on battens, paint	0.25	1106164004	A+
Canadian cedar cladding, breather membrane, <i>Kingspan TEK® Building System</i> panels, plasterboard on battens, paint	0.25	1106164003	A+
Clay tiles on timber battens, breather membrane, <i>Kingspan TEK® Building System</i> panels, plasterboard on battens, paint	0.54	1106164002	A
Concrete tiles on timber battens, breather membrane, <i>Kingspan TEK® Building System</i> panels, plasterboard on battens, paint	0.41	1106164001	A+
Polymeric render on cement bonded particle-board on timber battens, breather membrane, <i>Kingspan TEK® Building System</i> panels, plasterboard on battens, paint	0.41	1106164005	A+
Pitched Roof Elements			
<i>Kingspan TEK® Building System</i> panels, breather membrane, counterbattens, battens and concrete interlocking tiles	0.44	1112690005	A+
<i>Kingspan TEK® Building System</i> panels, breather membrane, counterbattens, battens and UK produced fibre cement slates	0.58	1112690004	B
<i>Kingspan TEK® Building System</i> panels, breather membrane, counterbattens, battens and resin bonded slates	0.76	1112690003	A
<i>Kingspan TEK® Building System</i> panels, breather membrane, counterbattens, battens and UK produced slates	0.67	1112690002	A
<i>Kingspan TEK® Building System</i> panels, breather membrane, counterbattens and UK produced clay plain tiles	0.58	1112690001	A

Table 2: Generic 2008 Green Guide Summary Ratings for Various Building Elements Based on *Kingspan TEK® Building System* Panels

# Design Considerations

*Kingspan TEK® Building System* panels are manufactured under a management system certified to BS EN ISO 14001: 2004. The principle polymer component of the insulation core of the product is also manufactured under a management system certified to EN ISO 14001: 2004.

*NB please confirm the above information at the point of need by contacting Kingspan Insulation's Technical Service Department (see rear cover), from which copies of Kingspan Insulation and its supplier's ISO 14001 and Kingspan Insulation's FSC® and PEFC Chain of Custody certificates can be obtained along with confirmation of the Green Guide ratings of building elements comprising Kingspan TEK® Building System panels.*

## BREEAM & The Code for Sustainable Homes

The *Kingspan TEK® Building System* can help achieve credits in a number of sections of the Code for Sustainable Homes and BREEAM. Technical bulletins have been produced covering, in detail, what credits are available. Copies of these technical bulletins can be downloaded from [www.kingspantek.co.uk/literature/technical-bulletins](http://www.kingspantek.co.uk/literature/technical-bulletins).

## Sustainability & Responsibility

Kingspan Insulation has a long-term commitment to sustainability and responsibility: as a manufacturer and supplier of insulation products; as an employer; as a substantial landholder; and as a key member of its neighbouring communities.

A report covering the sustainability and responsibility of Kingspan Insulation Ltd's British operations is available at [www.kingspaninsulation.co.uk/sustainabilityandresponsibility](http://www.kingspaninsulation.co.uk/sustainabilityandresponsibility).

## Less Transport

All the components for a typical *Kingspan TEK® Building System* kit, e.g. panels and ancillaries, come from one source, therefore there are fewer deliveries compared with more traditional construction methods, where components can often be sourced from, and delivered by, a number of different distributors or manufacturers. The overall result is less transport, congestion, noise and traffic pollution, which reduces a project's impact on the environment.

## Minimal Landfill

The UK construction industry generates at least 70 million tonnes of waste per annum. In addition to this, it is estimated that 13% of materials that go to site never get used and go straight into the waste stream. The key issue here is the land for landfill, which is fast running out. The government is currently dealing with this by imposing increasingly heavy landfill taxes. However, a number of EU countries have already instigated a landfill ban on combustible and recyclable materials.

The *Kingspan TEK® Building System* is factory manufactured, meaning there is minimal site wastage and therefore more efficient use of materials on-site. The minimal levels of site wastage means less site waste to landfill, which also helps to reduce cost.

# Financial Advantages

## Energy Savings

The thermal efficiency of the *Kingspan TEK*® Building System can offer dramatic energy cost savings over the lifetime of the building.

## Capital Cost Savings

To achieve equal energy performance e.g. a U-value of 0.21 W/m<sup>2</sup>·K and air leakage as approximately 1m<sup>3</sup>/hour/m<sup>2</sup> at 50 Pa, the capital cost of the *Kingspan TEK*® Building System would be considerably lower than an equivalent building using timber frame or masonry construction.

## Landfill Savings

The *Kingspan TEK*® Building System arrives on site as a complete scheme therefore there should be no site wastage apart from packaging materials and empty foam cans. This results in more efficient use of materials and also lower landfill fees.

## Labour Savings

The *Kingspan TEK*® Building System is designed and manufactured in the factory. Therefore, the scheme (including all ancillaries and fixings) is delivered complete and from one source, which will enable a weather-tight structure to be erected quickly.

Easily recognised components are shipped to the site for assembly, rather than waiting for a builder's interpretation of plans. *Kingspan TEK*® Building System panels also come in much larger dimensional sizes than other building materials meaning fewer components have to be handled during the erection process. A contractor's team of 4–6 can erect a typical *Kingspan TEK*® Building System house very quickly.

This can compare favourably with traditional construction techniques such as brick and block where there are more components which can result in more processes and therefore more labour and possible construction errors.

## Opens Doors Faster

When the building is built for the purpose of renting, the shorter construction time of the *Kingspan TEK*® Building System, can enable tenants to move in sooner and consequently the owner achieves a better cash flow and therefore faster payback.

# Delivery Partners

## Delivery Partners

Projects incorporating the *Kingspan TEK*® Building System are designed, coordinated and erected by a nationwide Delivery Partner network. These Delivery Partners have unrivalled knowledge of SIP construction and this ensures that the advantages of the *Kingspan TEK*® Building System are designed and built into every project.

A full list of approved UK, Irish and international Delivery Partners is available from the *Kingspan TEK*® Building System website (see rear cover).

*Kingspan TEK*® Delivery Partners typically have a background of timber frame, SIPs, green oak framing as well as traditional masonry construction and have undergone special training to erect the *Kingspan TEK*® Building System. The services offered by Delivery Partners range from simple erection of the *Kingspan TEK*® Building System through to a full turn key package including the provision heating and ventilation equipment, windows, doors, staircases and all external finishes.

The advantages of *Kingspan TEK*® Delivery Partner support are detailed below.

### Design

- Experienced in delivering dwellings from Code for Sustainable Homes level 5/6 to Passivhaus standard.
- Nationwide network with local knowledge.
- Experienced in all sectors of construction and external cladding.
- Collaborative approach with clients ensures design optimisation.
- Maximise design flexibility and spanning capability of the *Kingspan TEK*® Building System to minimise raw material costs.
- All supporting drawings and method statements are supplied.

### On Site

- Fully trained erectors offer peace of mind with predictable completion times, regardless of weather conditions.
- Rigorous attention to detail - audits ensure that excellence in design is replicated on site and 'as built' construction minimises air leakage and cold bridging.
- Single point of contact for entire supply chain, minimising risk and hassle for clients and contractors alike.
- CAD and CNC engineered offsite fabrication ensures the entire system arrives on site as a kit ready for installation without the need for additional on-site fabrication or waste.

Enquiries should be directed to a *Kingspan TEK*® Delivery Partner for the following:

- specific structural engineering design advice;
- to convert a drawing (including plans and elevations) into a *Kingspan TEK*® Building System design scheme; and
- quotations and lead times.



# Sitework

## Supply and Erect

Typically, the complete System is delivered to site ready for erection by fully qualified construction teams.



## Jointing *Kingspan TEK*® Building System Panels

*Kingspan TEK*® Building System panels have a routed channel along their long edges, which accommodate a unique cassette joint. These are fixed through the panel's OSB/3 facings. Expanding urethane sealant is applied between the urethane core of the cassette and the panel. Sealing this jointing system with the expanding urethane sealant enables the *Kingspan TEK*® Building System to be very air-tight.

## Lifting Panels

Lifting should be organised in accordance with the Contractors own method statement.

## Delivery of the *Kingspan TEK*® Building System

Information relating to the site and its access will be required and should be provided at an early stage e.g. quotation stage. When the *Kingspan TEK*® Building System is delivered, it will be via an appropriate sized vehicle.

Additional information relating to the unloading, use and positioning of a crane and other machinery should be discussed with the *Kingspan TEK*® Delivery Partner.



## Storage of Components

The polyethylene packaging of *Kingspan TEK*® Building System panels and associated timber components, should not be considered adequate for outdoor protection.

Ideally, *Kingspan TEK*® Building System panels and associated timbers should be stored inside a building. If, however, outside storage cannot be avoided, then all panels and timbers should be kept at least 150 mm off the ground on supports, and protected from the elements with an opaque polythene sheet or weatherproof tarpaulin sheet until used. Supports to *Kingspan TEK*® Building System panels should be positioned at maximum 1,200 mm centres ensuring the ground is flat, so that the panels will not twist.

Any products that have been allowed to get wet should not be used.

## Alterations to the *Kingspan TEK*® Building System

Alterations can usually be accommodated during the construction process if required. Prior approval in writing from Kingspan Insulation Technical Service Department will be required. Alterations following completion of the building are possible but more difficult and should, where possible, be carried out by a *Kingspan TEK*® Delivery Partner who has access to the original design plans.

*NB: A structural engineer must verify all alterations.*

# Sitework

## Water Ingress During Construction

*Kingspan TEK® Building System* panels are supplied so that they are protected from the elements during and after the construction process. A breathable membrane (e.g. *Kingspan nilvent®*) is factory applied to prevent site error.



## Fixing Items to *Kingspan TEK® Building System Walls*

### Through Plasterboard Fixed Direct to *Kingspan TEK Building System Panels*

Cabinets, boilers, radiators etc. can be fixed anywhere to the internal wall surface using appropriately sized screw fixings. Screws should be long enough to fully penetrate through the inner OSB face of the *Kingspan TEK® Building System* panel. For further information please contact the Kingspan Insulation Technical Services Department (see rear cover).

### Through Plasterboard Fixed to Timber Battens

Install noggins at locations where items are to be fixed. Noggins should be the same depth as the timber batten framework and should be fixed to the inner OSB face of the *Kingspan TEK® Building System* panel using appropriately sized screw fixings. Screws should be long enough to fully penetrate through the OSB. Cabinets, boilers, radiators etc. can be fixed through the plasterboard to the noggins using appropriately sized screw fixings.

Alternatively, in the case of rooms with many fixing points, or rooms that may be remodelled e.g. kitchens, 18 mm plywood may be fixed to the timber battens, using either drywall screws at 300 mm centres, or large headed galvanised clout nails at 150 mm centres, before the plasterboard is installed. Cabinets,

boilers, radiators etc. can be fixed anywhere to the internal wall surface using appropriately sized screw fixings. Screws should be long enough to fully penetrate through the plywood.

For further information please contact the Kingspan Insulation Technical Services Department (see rear cover).

## Services Installation

### Wiring

Where possible run wiring through internal stud partition walls. However, if it is necessary to run wiring on *Kingspan TEK® Building System* panels there are two possible methods, double layer plasterboard or single layer plasterboard on battens. Battens should be fixed to the inner OSB face of the *Kingspan TEK® Building System* panel using appropriately sized screw fixings. Screws should be long enough to fully penetrate through the OSB. With both methods ensure that the wiring is protected with an IEE approved metal guard (see Design – 'External Walls, Internal Linings').

Double layer plasterboard is an excellent option, especially if you are building to sell on or rent. Because there is no service cavity, *Kingspan TEK® Building System* walls have a very solid sound unlike timber frame walls.

### Plumbing

Plumbing is done in a conventional fashion, utilising interior partition walls and / or plumbing chases. Any small bore plumbing that must run on a *Kingspan TEK® Building System* wall should be surface mounted using pipe clips screwed through internal lining into the internal OSB/3 facing of the *Kingspan TEK® Building System* wall panels.



# Kingspan TEK® Building System Panel Details

## The Facings

Kingspan TEK® Building System panels are faced on both sides with a maximum of 15 mm OSB/3, autohesively bonded to the rigid thermoset urethane insulation core during manufacture.

## The Core

The core of Kingspan TEK® Building System panels is a high performance, thermoset, 112 mm thick rigid urethane insulant of typical density 33 kg/m<sup>3</sup>, manufactured with a blowing agent that has zero Ozone Depletion Potential (ODP) and low Global Warming Potential (GWP).



## Standards and Approvals

Kingspan TEK® Building System panels are manufactured to the highest standards under a management system certified to BS EN ISO : 9001 2008 (Quality management systems. Requirements), BS EN ISO 14001: 2004 (Environmental Management Systems. Requirements) and BS OHSAS 18001: 2007 (Health and Safety Management Systems. Requirements).

The Kingspan TEK® Building System's use is covered by European Technical Approval ETA-11/0466, BBA certificate 02/S029, and NSAI Agreement certificate 02/0158.



## Structural Dimensions

Kingspan TEK® Building System panels are available in the following standard size(s):

Nominal Dimension	Availability
Length (mm)	7,500 (max.) (for walls a maximum 3 m storey height is allowed)
Width (mm)	200 (min.) 1,220 (max.)
Thickness (mm)	142 (112 mm rigid urethane insulation core sandwiched between two layers of 15 mm OSB/3)

## Water Vapour Resistance

The insulation core of Kingspan TEK® Building System panels typically achieves a resistance of 33.6 MN-s/g, when tested in accordance with BS EN 12086: 1997 / I.S. EN 12086: 1998 (Thermal insulating products for building applications. Determination of water vapour transmission properties). The OSB/3 facing typically achieves 7.5 MN-s/g.

## Durability

The Kingspan TEK® Building System panels will have comparable durability to that of OSB/3 to BS EN 300 (Code of Practice for the selection and application of Particle Board, Oriented Strand Board (OSB), Cement Bonded Particle Board and Wood Fibre for specific purposes.), therefore as long as the System remains weather-tight, a life of at least 60 years may be expected.

## Resistance to Solvents, Fungi and Rodents

The rigid urethane insulation core is resistant to dilute acids, alkalis, mineral oil and petrol. It is not resistant to some solvent-based adhesive systems, particularly those containing methyl ethyl ketone.

Adhesives containing such solvents should not be used in association with Kingspan TEK® Building System. Kingspan TEK® Building System components, which have been in contact with harsh solvents, petrol, mineral oil or acids, or components that have been damaged in any way should not be used.

The rigid urethane insulation core and facings used in the manufacture of Kingspan TEK® Building System panels resist attack by mould and microbial growth and do not provide any food value to vermin.

## Strength & Stability

The permissible vertical load resistance for Kingspan TEK® Building System panels is sufficient for the System's use as loadbearing partitions, separating walls, the inner leaf of external walls and pitched roofs in dwellings up to four storeys high.

For specific structural properties please refer to European Technical Approval ETA-11/0466 and BBA certificate 02/S029, which is available from [www.kingspantek.co.uk/literature/certification](http://www.kingspantek.co.uk/literature/certification) or contact the Kingspan Insulation Technical Services Department (see rear cover).

# Kingspan TEK® Building System Panel Details

## Fire Performance

The *Kingspan TEK® Building System* in the construction specified in the table below, when subjected to the British Standard fire test BS 476-21: 1987 (Fire tests on building materials and structures. Methods for determination of the fire resistance of loadbearing elements of construction), has achieved the result shown.

Construction	Result
12.5 mm plasterboard, on 10 x 50 mm battens fixed to the OSB facing of the <i>Kingspan TEK® Building System Panel</i>	Passed half hour test – achieved 54 minutes insulation and integrity.

The *Kingspan TEK® Building System* in the construction specified in the table below, when subjected to the British Standard fire test BS 476-21: 1987 (Fire tests on building materials and structures. Methods for determination of the fire resistance of loadbearing elements of construction), has been assessed to achieve the result shown.

Construction	Result
12.5 mm fire resistant wall board over 12.5 mm plasterboard on 10 x 50 mm battens fixed directly to the OSB facing of the <i>Kingspan TEK® Building System Panel</i>	Assessed to pass one hour test – assessed to achieve 73 minutes insulation and integrity.

Further details on the fire performance of Kingspan Insulation products may be obtained from the Kingspan Insulation Technical Service Department (see rear cover).

## Resistance to Airborne Sound

Field tests to BS EN ISO 140-4: 1998 (Field measurements of airborne sound insulation between rooms) on separating walls, externally faced with 12.5 mm plasterboard, 19 mm gypsum planks and 9.5 mm plasterboard to each *Kingspan TEK® Building System* wall panel, achieved an average sound reduction of 58 dB ( $D_{nT,w}$  (C;C<sub>tr</sub>) 58 (-3; -7) dB).

A laboratory test on a single wall panel with no internal dry-lining achieved a sound reduction (R<sub>w</sub>) of 31 dB.

Robust Standard Details are available (see E-WT-1 and E-WT-2 in the Robust Standard Details handbook). Typically, party walls are manufactured from kiln dried timber stud components. Both timber frame wall panels that form the separating wall should be lined internally with (in order of application):

## Thermal Properties

The λ-values and R-values detailed below are quoted in accordance with BS EN 13165: 2008 (Thermal insulation products for buildings – Factory made rigid polyurethane foam (PUR) products – Specification).

### Thermal Conductivity

Thermal conductivity (λ-value) of the OSB/3 component of *Kingspan TEK® Building System* panels should be taken as 0.13 W/m·K. The thermal conductivity of the insulation core of *Kingspan TEK® Building System* panels is 0.023 W/m·K.

### Thermal Resistance

*Kingspan TEK® Building System* panels have a thermal resistance (R-value) of 5.100 m<sup>2</sup>·K/W. It is calculated by dividing the thickness of each component (expressed in metres) by its thermal conductivity and adding the resultant figures together. The resulting number is rounded down to the nearest 0.05 (m<sup>2</sup>·K/W).



# Contact Details

## Customer Service

For quotations, order placement and details of despatches please contact the Kingspan Insulation Customer Service Department on the numbers below:

UK	– Tel:	+44 (0) 1544 388 601
	– Fax:	+44 (0) 1544 388 888
	– email:	customerservice@kingspantek.co.uk
Ireland	– Tel:	+353 (0) 42 979 5000
	– Fax:	+353 (0) 42 975 4299
	– email:	info@kingspantek.ie

## Technical Advice

Kingspan Insulation supports all of its products with a comprehensive Technical Advisory Service for specifiers, stockists and contractors.

This includes a computer-aided service designed to give fast, accurate technical advice. Simply phone the Kingspan Insulation Technical Service Department with your project specification. Calculations can be carried out to provide U-values, condensation / dew point risk, required insulation thicknesses etc... Thereafter any number of permutations can be provided to help you achieve your desired targets.

The Kingspan Insulation Technical Service Department can also give general application advice and advice on design detailing and fixing etc... Site surveys are also undertaken as appropriate.

The Kingspan Insulation British Technical Service Department operates under a management system certified to the BBA Scheme for Assessing the Competency of Persons to Undertake U-value and Condensation Risk Calculations.



Please contact the Kingspan Insulation Technical Service Department on the numbers below:

UK	– Tel:	+44 (0) 1544 387 382
	– Fax:	+44 (0) 1544 387 482
	– email:	technical@kingspantek.co.uk
Ireland	– Tel:	+353 (0) 42 975 4297
	– Fax:	+353 (0) 42 975 4296
	– email:	technical@kingspantek.ie

## Literature & Samples

Kingspan Insulation produces a comprehensive range of technical literature for specifiers, contractors, stockists and end users. The literature contains clear 'user friendly' advice on typical design; design considerations; thermal properties; sitework and product data.

**Kingspan TEK**® technical literature is an essential specification tool. For copies please contact the Kingspan Insulation Marketing Department or visit the **Kingspan TEK**® website, using the details below:

UK	– Tel:	+44 (0) 1544 387 384
	– Fax:	+44 (0) 1544 387 484
	– email:	literature@kingspantek.co.uk
	– www.kingspantek.co.uk/literature	
Ireland	– Tel:	+353 (0) 42 979 5000
	– Fax:	+353 (0) 42 975 4299
	– email:	info@kingspantek.ie
	– www.kingspantek.ie/literature	

## General Enquiries

For all other enquiries contact Kingspan Insulation on the numbers below:

UK	– Tel:	+44 (0) 1544 388 601
	– Fax:	+44 (0) 1544 388 888
	– email:	info@kingspantek.co.uk
Ireland	– Tel:	+353 (0) 42 979 5000
	– Fax:	+353 (0) 42 975 4299
	– email:	info@kingspantek.ie

*Kingspan Insulation Ltd. reserves the right to amend product specifications without prior notice. The information, technical details and fixing instructions etc. included in this literature are given in good faith and apply to uses described. Recommendations for use should be verified for suitability and compliance with actual requirements, specifications and any applicable laws and regulations. For other applications or conditions of use, Kingspan offers a Technical Advisory Service (see above), the advice of which should be sought for uses of Kingspan products that are not specifically described herein. Please check that your copy of this literature is current by contacting the Kingspan Insulation Marketing Department (see above).*

Kingspan Insulation Ltd is a member of:  
The Structural Timber Association (STA)



**Kingspan Insulation Ltd**

Pembridge, Leominster, Herefordshire HR6 9LA, UK  
Castleblayney, County Monaghan, Ireland

[www.kingspantek.co.uk](http://www.kingspantek.co.uk) [www.kingspantek.ie](http://www.kingspantek.ie)