



# Kingspan **TEK**™

C O N S T R U C T I O N   M A N U A L



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# The Kingspan TEK Building System Construction Manual

## 1 INTRODUCTION

1.1 This construction manual is designed to provide registered contractors with the information required to safely erect the **Kingspan TEK Building System**. Some guidelines on finishing the System are also presented, but most finishing details are left to the discretion of the builder and specifier.

1.2 This construction manual should be used as a reference for **Kingspan TEK Building System** registered contractors. It assumes that the reader has a basic understanding of sound construction practices, including job site safety and the proper use of power tools.

The **Kingspan TEK Building System** provides a complete wall and roof shell.

The overall design and construction of the **Kingspan TEK Building System** is illustrated in Figure 1.



Figure 1 KINGSPAN TEK BUILDING SYSTEM

## 2 IMPORTANT INFORMATION

### 2.1 INFORMATION AND TRAINING

All relevant site personnel shall receive all necessary safety instruction before commencing work on site.

All documentation issued from Kingspan Insulation Ltd shall be available and familiar to site personnel prior to commencement of construction and each shall have attended the **Kingspan TEK Building System** training programme.

### 2.2 KEY BENEFITS OF THE KINGSPAN TEK BUILDING SYSTEM

The key benefits of the **Kingspan TEK Building System** are its high insulating properties, low thermal bridging and superb air tightness resulting in a System that is highly energy efficient. Air tightness is critically dependant on erection quality, therefore every joint must be sealed in accordance guidelines detailed in this construction manual.

### 2.3 HANDLING OF COMPONENTS

All unloading shall be done in a safe manner using only recommended or approved lifting equipment/ attachments (See Tool List in Appendix D). All loose materials are to be built into bundles, provided with a lifting hook or other suitable lifting facility and strapped to assist unloading.

### 2.4 STORAGE OF COMPONENTS

**Kingspan TEK Building System** panels should be kept at least 150 mm off the ground on supports, and protected from the elements until used. Supports should be supplied at maximum 1200 mm centres ensuring the ground is flat, to prevent them from twisting. Ideally they should be stored under cover.

### 2.5 FOUNDATION CONSTRUCTION

**Kingspan TEK Building System** construction depends on the foundation being square and level within very tight tolerances. If the foundation is out of square or not level, panel installation will be much more difficult. Refer to section 3 of this document for foundation tolerances.

### 2.6 FIXING SPECIFICATIONS

Table 1 on page 4 provides a reference for nail and screw specifications with the most common applications. Information on nail and screw specifications for less common applications, is provided throughout this construction manual.

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## FIXING SPECIFICATIONS

Application	Fastener Type	Spacing
Fixing 50 mm x 110 mm bottomplates to soleplates	3.1 mm x 90 mm galvanised ring-shank nails	200 mm centres in two staggered rows
Fixing 15 mm x 100 mm OSB3 splines into <b>Kingspan TEK Building System</b> panels	2.8 mm x 63 mm galvanised ring-shank nails	100 mm centres both sides of the panel
Fixing 50 mm x 110 mm bottomplates, headplates, end timbers, edge timbers into <b>Kingspan TEK Building System</b> panels	2.8 mm x 63 mm galvanised ring-shank nails	50 mm centres both sides of the panel
Fixing 100 mm x 110 mm timber posts into <b>Kingspan TEK Building System</b> panels	2.8 mm x 63 mm galvanised ring-shank nails	50 mm centres both sides of the panel
Fixing 110 mm x 150 mm bevelled headplate to <b>Kingspan TEK Building System</b> panels	2.8 mm x 63 mm galvanised ring-shank nails	50 mm centres both sides of the panel
Fixing <b>Kingspan TEK Building System</b> wall panels at corner joints	6.0 mm x 210 mm sparrennagel	Typically 300 mm* centres. Fasteners should only be fixed into 4.0 mm dia. pre-drilled holes.
Fixing <b>Kingspan TEK Building System</b> roof sections at wall / floor junctions, ridge beams, intermediate purlins and gable walls	6.0 mm x 210 mm sparrennagel	Typically 300 mm* centres. Fasteners should only be fixed into 4.0 mm dia. pre-drilled holes.
Fixing joist hangers to headplate or laminated beams (fixings may vary depending on specification of joist hanger – please refer to manufacturers instruction floor system in Appendix E)	3.75 mm x 32 mm square twist shank nails or Simpson N10 nails	Into side and top of headplate in locations marked out
Fixing I-beams / joist to joist hanger (fasteners may vary depending on specification of joist hanger – please refer to manufacturers instruction floor system in Appendix E)	3.75 mm x 32 mm square twist shank nails or Simpson N10 nails	In pre-drilled holes for bottom flange
Option 1 Fixing OSB3 floor decking to joists/ headplate or header joist	2.8 mm x 63 mm galvanised ring-shank nails	Maximum 200 mm centres
Option 2 Fixing rim board to headplate	Skew nail 3.75 mm x 75 mm round wire nails	150 mm
Fixing OSB3 floor decking to joists/rimboard	3.35 mm x 65 mm round wire nails	200 mm

Table 1

\*Refer to structural calculations for variations in fixing centres.

NB. Screw fixings may be used in the place of nails. Contact Kingspan Insulation Technical Services for further information (see rear cover). Heads of nail fixings should be flush with the surface of the OSB3 facing. Ensure nail gun is adjusted to the appropriate setting.

### 3 FOUNDATION ASSESSMENT

It is extremely important that you provide an accurate, level and square platform on which to erect the **Kingspan TEK Building System**.

It is extremely important that the soleplate of the building exactly matches the dimensions of the **Kingspan TEK Building System**, and that all corners are square.

Foundation width and length should be within 5 mm of the dimensions called for in the foundation plans. Check the diagonal as shown in Figure 2. Pairs of diagonal measurements should be within 5 mm.

The top level of the slab shall also not vary from the design by more than  $\pm 5$  mm. Slight variations in foundation dimensions can be dealt with when setting the soleplate, but variations outside of these tolerances will make panel erection significantly more difficult. If the diagonals do not match exactly, some adjustment can be made when setting the soleplates. If the diagonal measurements are not given on the foundation or first floor plan, they can be calculated by using the formula  $c = \sqrt{a^2 + b^2}$  as shown in Figure 2.

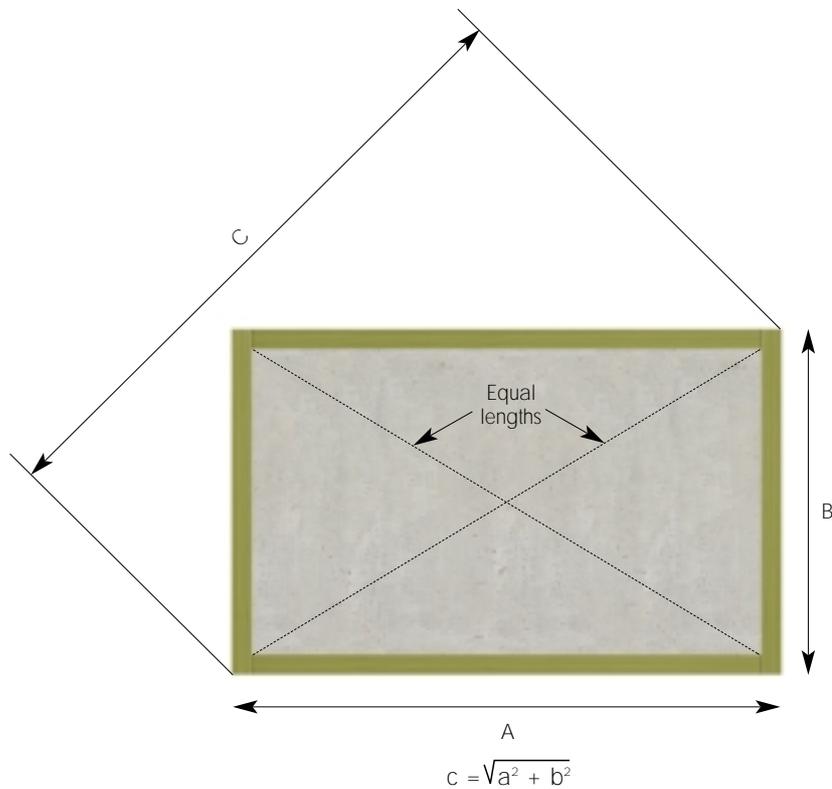


Figure 2 CHECKING FOUNDATION SQUARE

The base or foundation should be swept and cleaned of all material and debris before starting erection of the **Kingspan TEK Building System**.

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## 4 COMBINATION SOLEPLATE INSTALLATION

### 4.1 PREPARATION OF COMBINATION SOLEPLATE

The combination soleplate (see Figure 3a) comprises a damp proof course (DPC) below a 40 mm x 140 mm treated timber soleplate below a 50 mm x 110 mm timber bottomplate. The complete unit is then fixed to the foundation or substructures (see Figure 3b) in accordance with the fixing specification in Table 1, section 2.6.

**Caution:** Where treated timber soleplates are not supplied by Kingspan Insulation Ltd. they should be cut from treated softwood (C24).

First, connect the soleplate to the bottomplate in accordance with the fixing specification in Table 1, section 2.6, ensuring that two beads of silicone sealant are applied between the two elements prior to fixing.

**HINT:** Use a scrap of 15 mm wood as a gauge when you position the bottomplates.

Then, apply two beads of silicone sealant to the topside of the DPC to create a seal between it and the treated timber soleplate. The DPC should then be fixed to the underside of the treated timber soleplate, flush to the inside edge, using two rows of staples at 100 mm centres (rows should be staggered).

### 4.2 POSITIONING AND FIXING COMBINATION SOLEPLATE

Accurately mark out all internal and external wall positions using a tape and chalk line. Using a Surveyors Level or laser, proceed to level the soleplate by taking levels at 1 m intervals along the lines of the walls in order to find the highest point. Using the level of the highest point as a datum, raise the treated timber soleplate at all other locations using shims to match this level. All points should be shimmed to within  $\pm 1$  mm. Colour coded shimming strips are available in various sizes from 2 mm to 6 mm as detailed in Table 2.

Shim thickness	Shim Colour
2	Purple
3	Green
4	Yellow
5	Blue
6	Black

Table 2

Position and fix the combination soleplate over the shims (DPC facing down) in accordance with the structural calculations and appropriate **Kingspan TEK Building System** standard details\*. Where posts or columns bear directly onto the slab these should be located using steel shims only (NOT PLASTIC).

\*Specification for fixing the treated timber soleplate will be given by Kingspan Insulation Ltd.

To seal against air infiltration under the soleplate, point the gap between the DPC and the base with a non-shrink cementitious mortar as shown in Figure 3C.

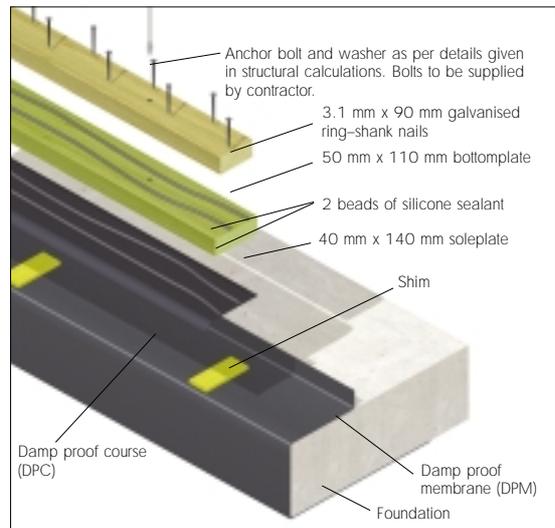
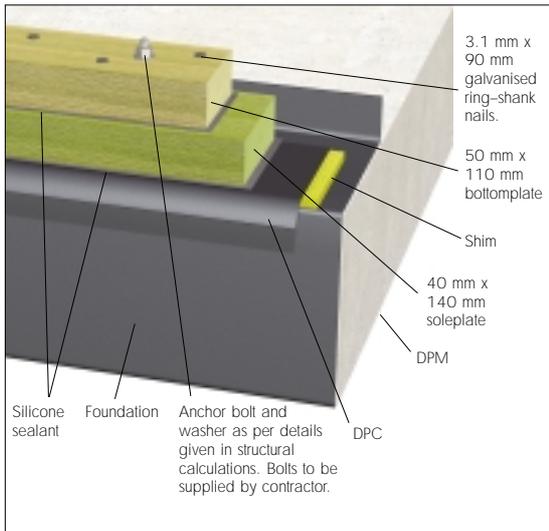
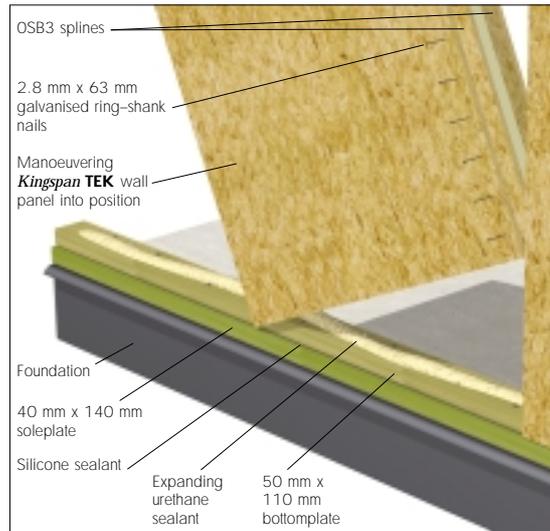


Figure 3a PREPARATION OF COMBINATION SOLEPLATE

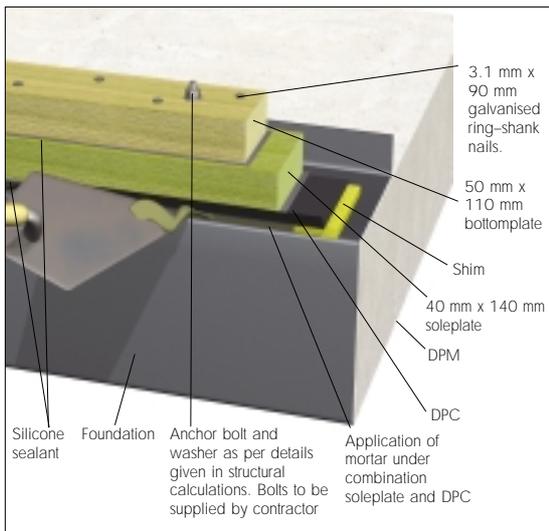
A floating timber floor e.g. Kingspan Thermafloor TF73 zero ODP or equivalent, should be used in conjunction with the ground floor details shown in this construction manual



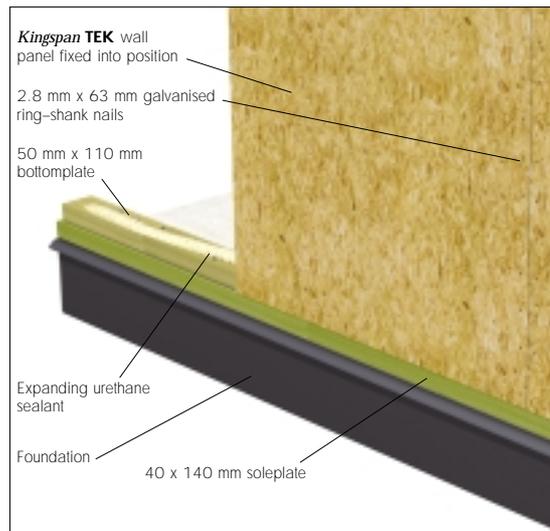
**Figure 3b** INSTALLATION OF COMBINATION SOLEPLATE



**Figure 4a** WALL PANEL JOINTS > 300 mm FROM JOINTS IN BOTTOMPLATES



**Figure 3c** APPLICATION OF MORTAR UNDER COMBINATION SOLEPLATE



**Figure 4b** WALL PANEL JOINTS > 300 mm FROM JOINTS IN BOTTOMPLATES

**CAUTION:** Ensure butt joints in the bottomplate are a minimum of 300 mm away from the **Kingspan TEK** Building System wall panel joint. This is illustrated in Figures 4a and 4b.

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## 5 WALL ASSEMBLY – PANEL BY PANEL

### 5.1 GENERAL

It is assumed that the **Kingspan TEK Building System** registered contractor has made sufficient provision for all temporary works necessary to assemble the project safely and that they have prepared method statements to address difficult stages of work as appropriate. It is similarly assumed that scaffolding and safe working platforms will be constructed as the project proceeds to ensure a safe working environment at all times. For a list of standard risks and hazards that are inherent to the System please refer to Appendix C.

### 5.2 HANDLING PANELS

**Kingspan TEK Building System** wall panels should preferably be lifted and manoeuvred in accordance with the contractors method statement, preferably using appropriate mechanical lifting equipment.

### 5.3 SORTING OF WALL COMPONENTS

The first wall should be started at the external corner furthest away from the main stack of **Kingspan TEK Building System** wall panels. The first wall panel to be erected should be the overlapping corner panel\*. This is illustrated in Figures 5a, 5b and 5c on page 9. Identify the required components for the first wall and place them near to the wall being erected. All OSB3 splines, timber posts and end timbers should be cut to the required length such that the full depth of routed out channels in the top and bottom of the wall panel are unobstructed.

### 5.4 PREPARATION OF THE FIRST PANEL

All routs should be brushed clean of any debris and checked for proper forming and depth. End timbers and OSB3 splines must be fixed into the panel before the panels are erected and in accordance with the fixing specification in Table 1, section 2.6.

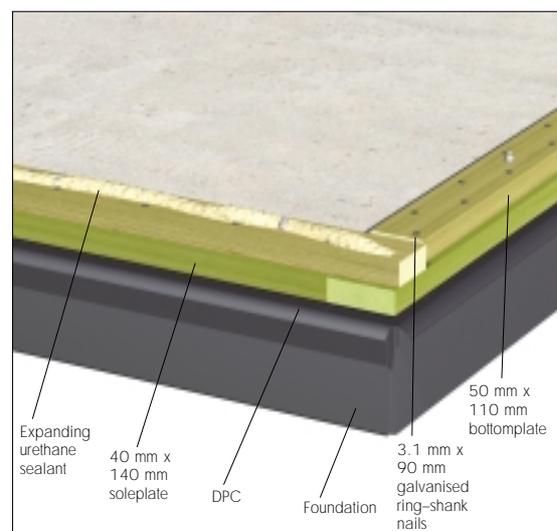
### 5.5 ERECTION OF THE FIRST WALL PANEL

**Hint:** Using site plans as a guide, mark out wall panel joints on the combination soleplate before erecting the first wall panel. If wall panels joints are not in line with the markings on the combination soleplate, corrective action should be taken immediately.

Apply a bead of expanding urethane sealant onto the bottomplate to ensure that an airtight joint is achieved. Manoeuvre the **Kingspan TEK Building System** wall panel into position. Push it right down so that it is in full contact with the top face of the soleplate. The end timber within the wall panel must be perfectly flush with the outer edges of the corner. This is illustrated in Figure 5c on page 9.

**HINT:** Do not nail any **Kingspan TEK Building System** wall panels into the bottomplate until the roof is on the house, this will allow the walls to settle onto the soleplate giving the panel a more even load distribution.

Check that the wall panel is both level and vertical prior to installing a diagonal brace that will temporarily secure the wall panel in its correct position. This can be done using 50 mm x 100 mm timbers or proprietary wall braces.



**Figure 5a** COMBINATION SOLEPLATES READY TO RECEIVE WALL PANEL

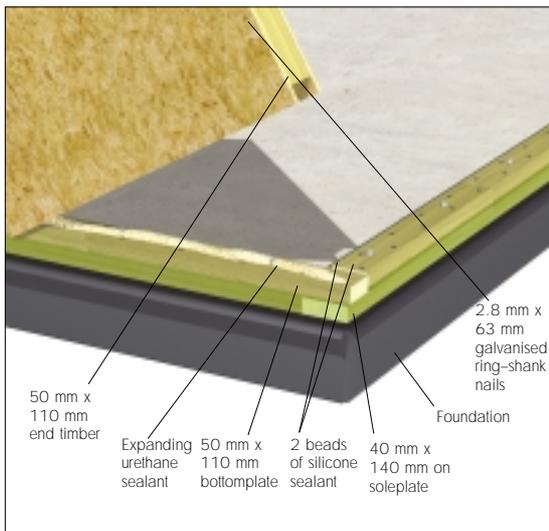


Figure 5b ERECTION OF FIRST WALL PANEL

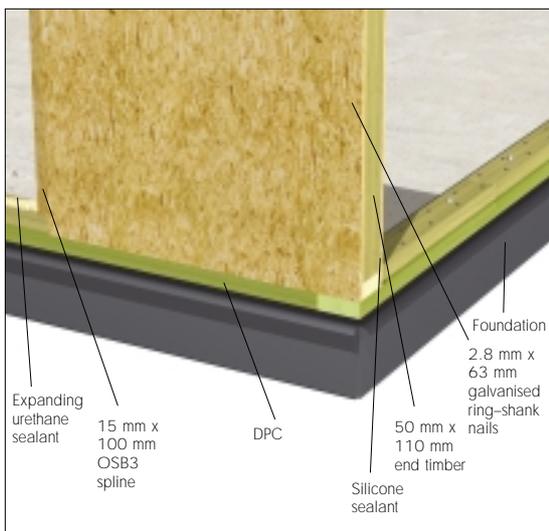


Figure 5c FIXING FIRST WALL PANEL

### 5.6 ERECTING SUBSEQUENT WALL PANELS ALONG THE FIRST WALL

Prepare subsequent **Kingspan TEK Building System** wall panels by fixing OSB3 splines, timber posts or end timbers as before. Apply expanding urethane sealant onto the bottomplate and into the central vertical routed channel(s) of the previously erected panel\* to ensure an airtight seal is achieved.

Manoeuvre the wall panel into position so that the timber post or OSB3 spline is ready to engage the previously erected wall panel as illustrated in Figure 6 below. Firmly push the wall panel into place ensuring that all edges are tightly abuted. Where joints need tightening to ensure edges are tightly abuted use ratchet straps.

\*The bead of expanding urethane sealant can also be injected into OSB3 spline joints after the **Kingspan TEK Building System** wall panels have been nailed together to facilitate parallel working. This is achieved by injecting the expanding urethane sealant through appropriately sized holes, drilled into the joint at approximately 300 mm centres. This cannot be undertaken where solid timber posts connect wall panels.

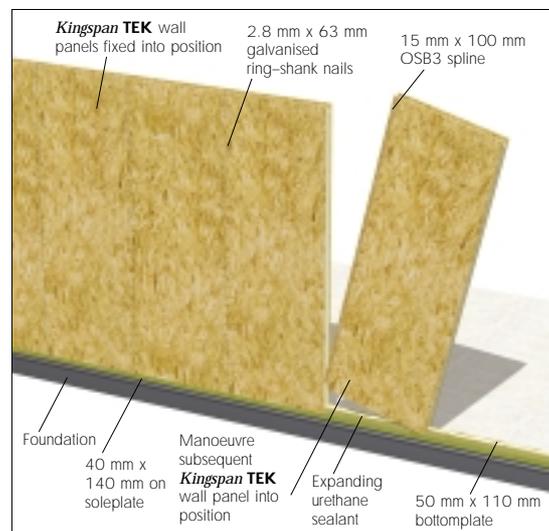


Figure 6 ERECTION OF SUBSEQUENT WALL PANELS

With the wall panel in position, fix the remaining fasteners along the joints in accordance with the fixing specification in Table 1, section 2.6.

The final wall panel within the wall should be fitted with an end timber, which should be fixed in accordance with the fixing specification in Table 1, section 2.6, to allow correct corner assembly. Again, the end timber within the wall panel must be perfectly flush with the outer edges of the corner. This is illustrated in Figure 5c.

**HINT:** A temporary raking wall brace should always be placed within 200 mm of junctions between interior wall and exterior walls to ensure that this load bearing connection can be properly formed.

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Figures 7 and 8 below illustrate the two standard wall panel jointing methods.

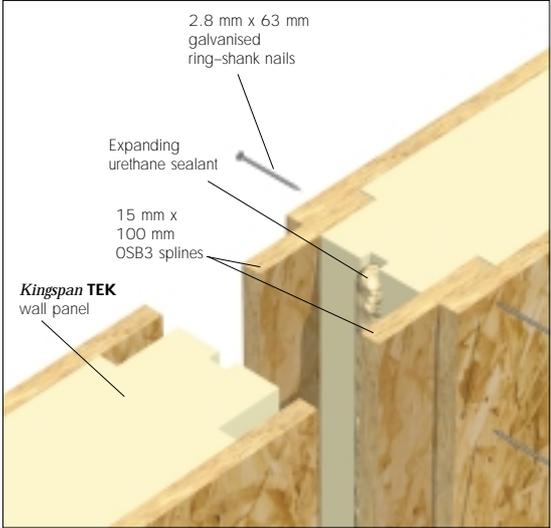


Figure 7a OSB3 SPLINE JOINT

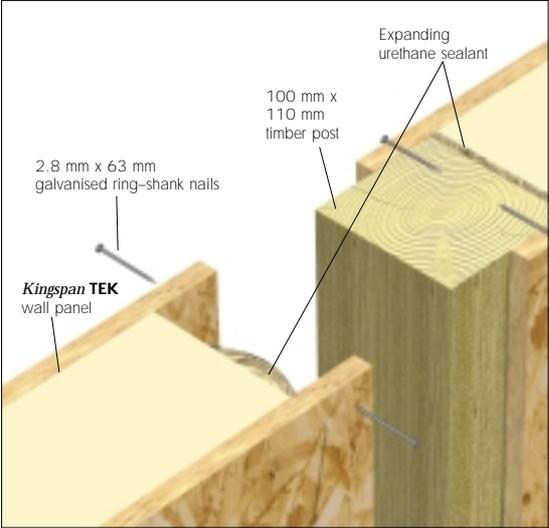


Figure 8a TIMBER POST JOINT

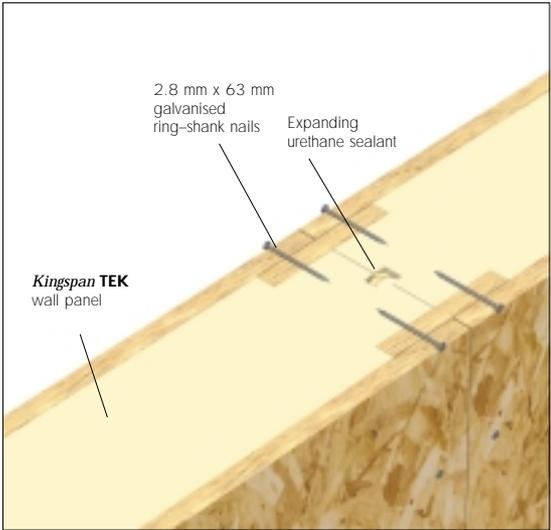


Figure 7b FIXED OSB3 SPLINE JOINT

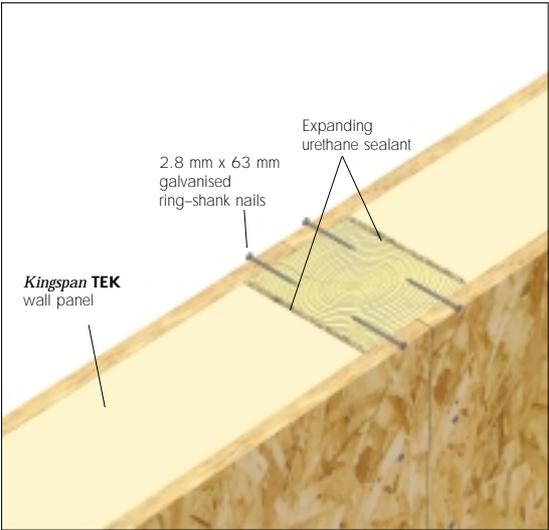


Figure 8b FIXED TIMBER POST JOINT

### 5.7 ERECTING SUBSEQUENT WALLS

The corner joint should first be sealed with two beads of silicone sealant and then fasteners should be fixed through the corners into the end timbers in accordance with the fixing specification in Table 1, section 2.6. This detail is illustrated in Figures 9a and 9b.

The rest of the walls should be erected in a similar manner. When all exterior and interior walls have been erected and headplates have been installed (See section 5.8) a horizontal line should be pulled between pairs of building corners to finally check that wall panels are correctly located. Additional raking braces should be used (or adjusted) to make any necessary wall panel realignment.

Where the **Kingspan TEK Building System** wall panels are used as internal walls, they need to be plumbed and levelled with the top of the external walls, braced as before and fixed in accordance with the fixing specification in Table 1, section 2.6.

As with external walls, use adjustable wall braces where necessary to ensure internal walls are in their correct position.

**Hint:** Ensure that sufficient wall braces are used to stabilise the wall construction during the erection of the final storey and that these remain in place until the roof has been completed.

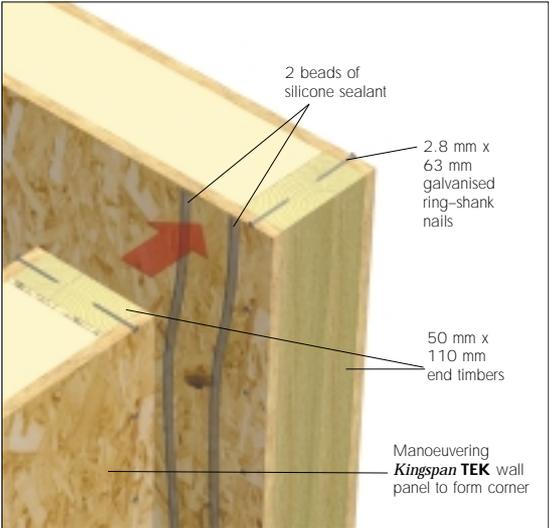


Figure 9a CREATION OF CORNER JOINT

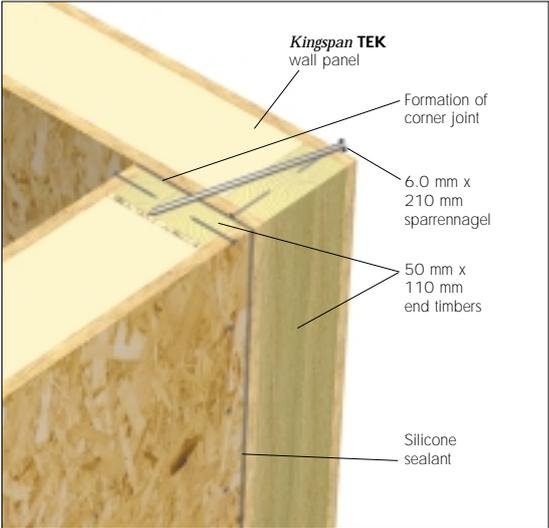


Figure 9b FIXING OF CORNER JOINT

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## 5.8 INSTALLING HEADPLATES

Apply expanding urethane sealant into the factory routed channel at the top of the **Kingspan TEK Building System** wall panels. The headplates should then be located within the rout and fastened in accordance with the fixing specification in Table 1, section 2.6. This is illustrated in Figure 10 below. Headplate joints should be staggered so that they offset vertical joints between **Kingspan TEK Building System** wall panels by a minimum of 300 mm.

The installation of the headplate should be undertaken immediately after the erection of the wall to prevent excessive amounts of water standing in the rout. Headplates tie the wall panels together and provide a continuous solid surface to support the first floor deck.

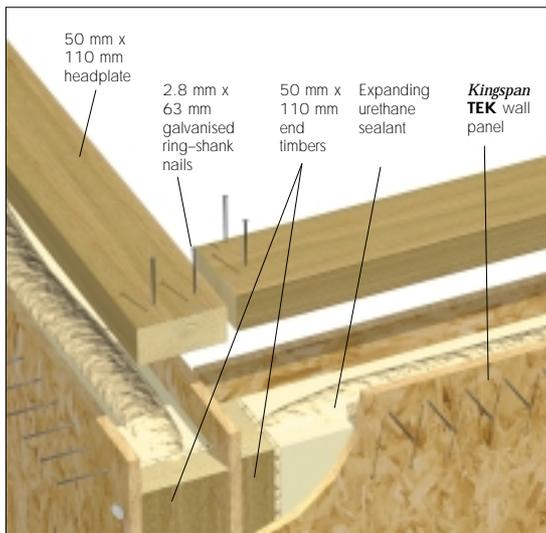


Figure 10 INSTALLATION OF HEADPLATES

## 5.9 STANDARD DOOR AND WINDOW OPENINGS

**Kingspan TEK** Building System wall panels will arrive (unless specified otherwise) from the factory pre-cut and routed for window and door openings. The routed grooves will (unless specified otherwise) be 50 mm deep so that the 50 mm x 110 mm edge timbers can be fully inset around the whole window or door perimeter as illustrated in Figure 11a and b. These timbers need installing as soon as the wall panels have been erected to prevent excessive amounts of water standing in the rout.

Edge timbers should be installed as previously described, above both when the opening is enclosed within one **Kingspan TEK** Building System wall panel and also when it extends into any adjoining wall panels. With all openings for windows and doors, the edge timbers should be cut and installed into the routed channels to match the configuration illustrated in Figure 11a and b. This helps distribute the load carried by the edge timber that forms the timber headplate. All these timbers should be fixed in accordance with the fixing specification in Table 1, section 2.6.

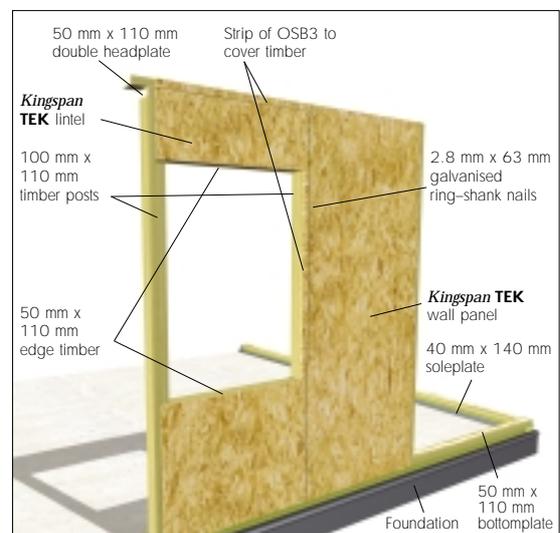


Figure 11a OPENING FOR WINDOW

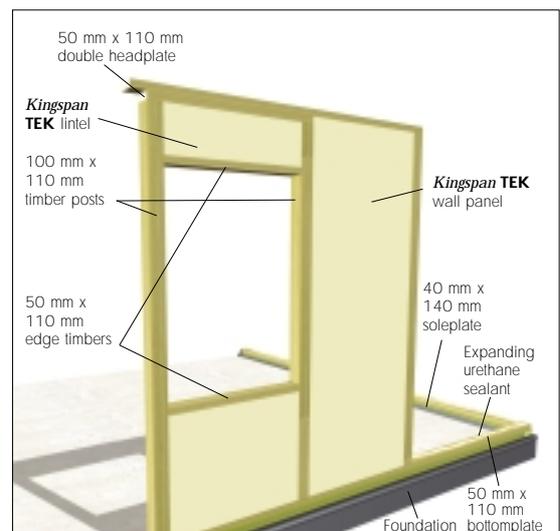


Figure 11b OPENING FOR WINDOW – CROSS SECTION