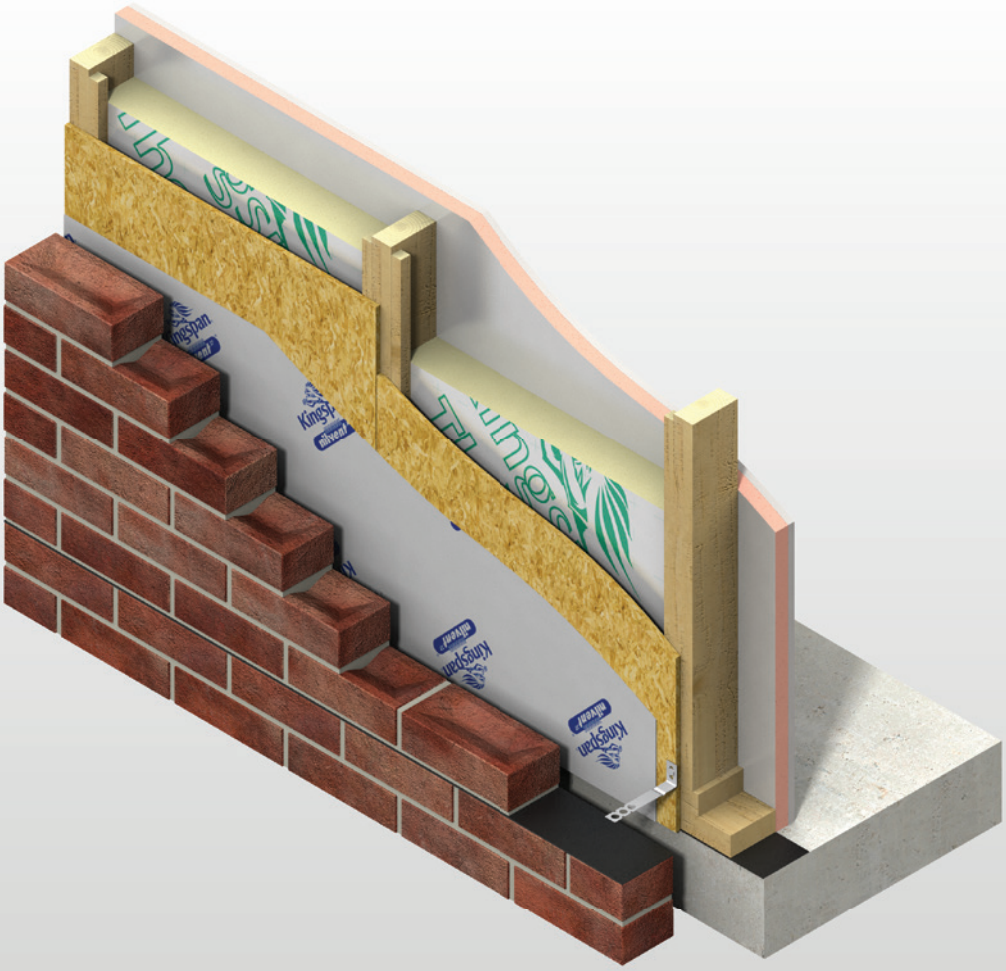
CI/SfB (21.9) Rn7 M2
Seventh Issue December 2017

# Thermawall® TW55

## INSULATION FOR TIMBER AND STEEL FRAMING SYSTEMS



- High performance rigid thermoset insulation – thermal conductivity 0.022 W/m·K
- Can be used between studs or as an insulating sheathing
- Suitable for use with timber frame and steel frame wall constructions
- Unaffected by air infiltration
- Resistant to the passage of water vapour
- Easy to handle and install
- Ideal for new build or refurbishment
- Non–deleterious material
- Manufactured with a blowing agent that has zero ODP and low GWP

Fibre-free Core

Kingspan®

*Low Energy – Low Carbon Buildings*

# Typical Constructions and U-values

## Assumptions

CERTIFICATE CS/1004-4
U Value Competency Scheme

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 EN ISO 6946: 2017 / I.S. EN ISO 6946: 2007 (Building components and building elements. Thermal resistance and thermal transmittance. Calculation methods), and using the conventions set out in BR 443 (Conventions for U–value calculations). They are valid for the constructions shown in the details immediately above each table.

Unless otherwise stated both the timber and steel frame U–values quoted are based on an internal construction comprising a 3 mm plaster skim on 15 mm plasterboard. The external finishes are as specified in the examples themselves.

*NB When calculating U–values to BS EN ISO 6946: 2017 / I.S. EN ISO 6946: 2007, the type of mechanical fixing used may change the thickness of insulation required. The effect of fixings for Kingspan* **Kool**therm® K118 Insulated Plasterboard *has been ignored in these calculations, as the insulation layer penetrated is not the main insulation layer. For the purposes of timber frame calculations which feature insulating sheathing, the use of stainless steel fasteners of cross sectional area 7.45 mm² has been assumed at a density of 4.4 per m². For steel frame calculations featuring insulating sheathing, the use of carbon steel fasteners of cross sectional area 14.8 mm² has been assumed at a density of 4.5 per m².*

*NB For calculations which feature insulation between timber frame studs / timber battens, a 15% bridging factor has been assumed. The thermal conductivity of the timber has been assumed to be 0.12 W/m·K.*

*NB Calculations assume that the use of a foil faced breathable membrane yields an airspace thermal resistance of 0.54 m²·K/W. Calculations assume that a 4 mm foil faced bubble breathable membrane yields a combined product and airspace thermal resistance of 0.79 m²·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 and a condensation risk analysis should be completed for each project.*

*NB If your construction is different from 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).*

## U-value Table Key

Where an ✗ is shown, the U–value is higher than the worst of the maximum new build area weighted average U–values allowed by the:

- 2013 editions of Approved Documents L to the Building Regulations for England;
- 2014 editions of Approved Documents L to the Building Regulations for Wales;
- 2015 editions of Technical Handbooks Section 6 to the Building Standards for Scotland;
- 2012 editions of Technical Booklets F1 & F2 to the Building Regulations for Northern Ireland; and
- 2011 edition of Technical Guidance Document L (Dwellings) and 2008 edition of Technical Guidance Document L (Buildings other than Dwellings) to the Building Regulations for the Republic of Ireland.

Where an 💧 is shown, the combination of insulation products may result in an interstitial condensation risk and so the calculations have been excluded.

## Refurbishment – Internal Dry Lining

### Insulation Between, and Insulated Plasterboard Fixed to Timber Framework on Solid Brick Wall

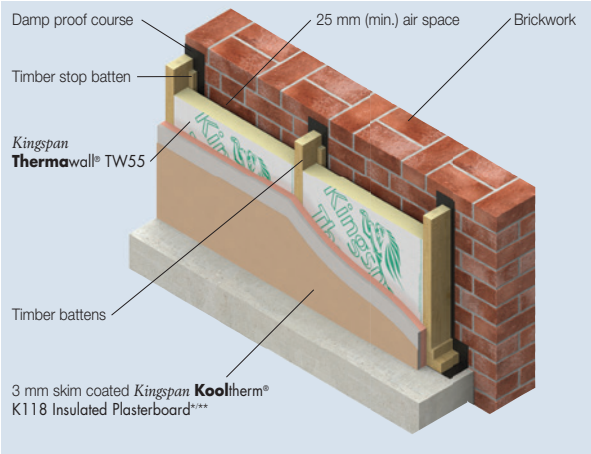



Figure 1

| U–values (W/m²·K) for Various Thicknesses of Insulation, Timber Depths, and Brickwork Thicknesses | | | |
|---|---|---|---|
| Thickness of *Kingspan* **Therma**wall® TW55 Between Timbers (mm) | Product Thickness of *Kingspan* **Kool**therm® K118 Insulated Plasterboard*** Fixed to Timbers (mm) | Brickwork Thickness (mm) 102.5 | 215 |
| **75 mm Deep Timbers** | | | |
| 50 | 0* | ✗ | ✗ |
| 50 | 32.5 | 0.27 | 0.26 |
| 50 | 37.5 | 0.25 | 0.24 |
| 50 | 42.5 | 0.24 | 0.23 |
| 50 | 52.5 | 0.21 | 0.20 |
| 50 | 57.5 | 💧 | 💧 |
| 50 | 62.5 | 💧 | 💧 |
| **100 mm Deep Timbers** | | | |
| 75 | 0* | 0.33 | 0.31 |
| 75 | 32.5 | 0.23 | 0.22 |
| 75 | 37.5 | 0.22 | 0.21 |
| 75 | 42.5 | 0.20 | 0.20 |
| 75 | 52.5 | 0.18 | 0.18 |
| 75 | 57.5 | 0.17 | 0.17 |
| 75 | 62.5 | 0.16 | 0.16 |
| 75 | 72.5 | 0.15 | 0.15 |
| 75 | 77.5 | 💧 | 💧 |
| 75 | 82.5 | 💧 | 💧 |

* *Calculations which feature insulation between studwork only, assume the use of 15 mm plasterboard and a polythene sheet vapour control layer in order to minimise the risk of condensation (see 'Design Considerations – Water Vapour Control').*

** *Kingspan* **Kool**therm® K118 Insulated Plasterboard *contains an integral vapour control layer in order to minimise the risk of condensation (see 'Design Considerations – Water Vapour Control').*

*** *Product thicknesses = insulant thickness + 12.5 mm plasterboard.*

*NB Refer to local distributor or Kingspan Insulation price list for current stock and non–stock sizes.*

# Timber Frame Wall with 102.5 mm Brickwork Outer Leaf

## Insulation Between Timber Frame Studs with *Kingspan* **Kool**therm® K118 Insulated Plasterboard **Fixed Internally**

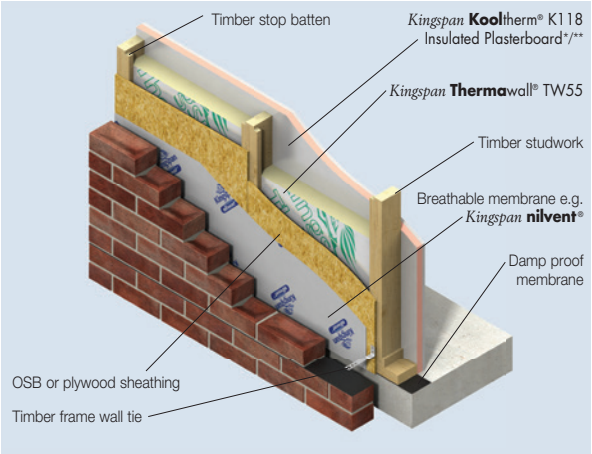



Figure 2

| U–values (W/m²·K) for Various Thicknesses of Insulation, Stud Depths, and Breathable Membranes | | | | |
|---|---|---|---|---|
| Thickness of *Kingspan* **Therma**wall® TW55 Between Studs (mm) | Product Thickness of *Kingspan* **Kool**therm® K118 Insulated Plasterboard*** Inside Studs (mm) | Breathable Membrane Type | | |
| | | Standard | Foil Faced | Foil Faced Bubble |
| 89 mm Deep Timber Studs | | | | |
| 25 | 0* | ✗ | ✗ | ✗ |
| 30 | 0* | ✗ | ✗ | 0.35 |
| 35 | 0* | ✗ | ✗ | 0.34 |
| 40 | 0* | ✗ | 0.35 | 0.32 |
| 50 | 0* | ✗ | 0.32 | 0.30 |
| 55 | 0* | 0.35 | 0.31 | 0.28 |
| 60 | 0* | 0.34 | 0.30 | 0.28 |
| 70 | 0* | 0.32 | 0.28 | 0.26 |
| 70 | 32.5 | 0.23 | 0.21 | 0.20 |
| 70 | 37.5 | 0.21 | 0.20 | 0.19 |
| 70 | 42.5 | 0.20 | 0.19 | 0.18 |
| 70 | 52.5 | 0.18 | 0.17 | 0.16 |
| 70 | 57.5 | 0.17 | 0.16 | 0.16 |
| 70 | 62.5 | 0.16 | 0.15 | 0.15 |
| 70 | 72.5 | 💧 | 💧 | 💧 |
| 140 mm Deep Timber Studs | | | | |
| 25 | 0* | ✗ | ✗ | ✗ |
| 30 | 0* | ✗ | ✗ | 0.34 |
| 35 | 0* | ✗ | 0.35 | 0.32 |
| 40 | 0* | ✗ | 0.34 | 0.31 |
| 45 | 0* | ✗ | 0.32 | 0.30 |
| 50 | 0* | 0.34 | 0.31 | 0.28 |
| 60 | 0* | 0.31 | 0.28 | 0.26 |
| 70 | 0* | 0.29 | 0.26 | 0.24 |
| 75 | 0* | 0.28 | 0.25 | 0.24 |
| 80 | 0* | 0.27 | 0.25 | 0.23 |
| 90 | 0* | 0.25 | 0.23 | 0.22 |
| 100 | 0* | 0.24 | 0.22 | 0.21 |
| 110 | 0* | 0.23 | 0.21 | 0.20 |
| 120 | 0* | 0.22 | 0.20 | 0.19 |
| 120 | 32.5 | 0.17 | 0.16 | 0.15 |
| 120 | 37.5 | 0.16 | 0.15 | 0.15 |
| 120 | 42.5 | 0.15 | 0.15 | 0.14 |
| 120 | 52.5 | 0.14 | 0.13 | 0.13 |

## Insulation Between Timber Frame Studs and Insulated Sheathing

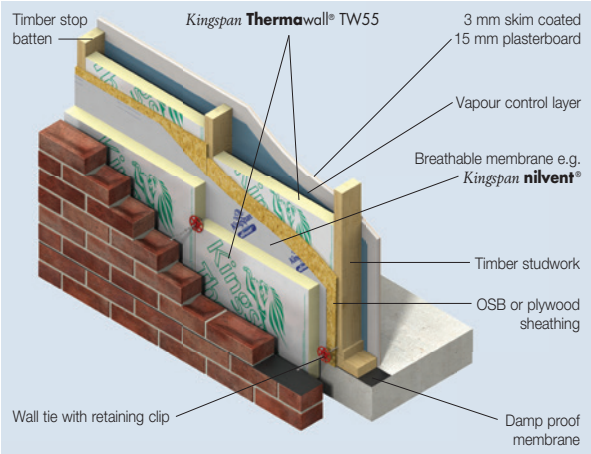



Figure 3

| U–values for Various Thicknesses of Insulation and Stud Depths | |
|---|---|
| Thickness of *Kingspan* **Therma**wall® TW55 (mm) | U–values (W/m²·K) |
| 89 mm Deep Timber Studs | |
| 20 + 20 | 0.30 |
| 25 + 25 | 0.27 |
| 30 + 30 | 0.24 |
| 40 + 40 | 0.21 |
| 50 + 50 | 0.18 |
| 60 + 60 | 0.16 |
| 70 + 70 | 0.14 |
| 140 mm Deep Timber Studs | |
| 20 + 20 | 0.29 |
| 25 + 25 | 0.26 |
| 30 + 30 | 0.24 |
| 40 + 40 | 0.20 |
| 50 + 50 | 0.18 |
| 60 + 60 | 0.15 |
| 70 + 70 | 0.14 |

*NB Refer to local distributor or Kingspan Insulation price list for current stock and non–stock sizes.*

* *Calculations which feature insulation between studwork only, assume the use of 15 mm plasterboard and a polythene sheet vapour control layer in order to minimise the risk of condensation (see 'Design Considerations – Water Vapour Control').*

** *Kingspan* **Kool**therm® K118 Insulated Plasterboard *contains an integral vapour control layer (see 'Design Considerations – Water Vapour Control').*

*** *Product thicknesses = insulant thickness + 12.5 mm plasterboard.*

*NB Refer to local distributor or Kingspan Insulation price list for current stock and non–stock sizes.*

# Typical Constructions and U-values

## Timber Frame Wall with 10 mm Polymer Rendered 100 mm Dense Blockwork Outer Leaf*

### Insulation Between Timber Frame Studs with *Kingspan* **Kool**therm® K118 Insulated Plasterboard **Fixed Internally**

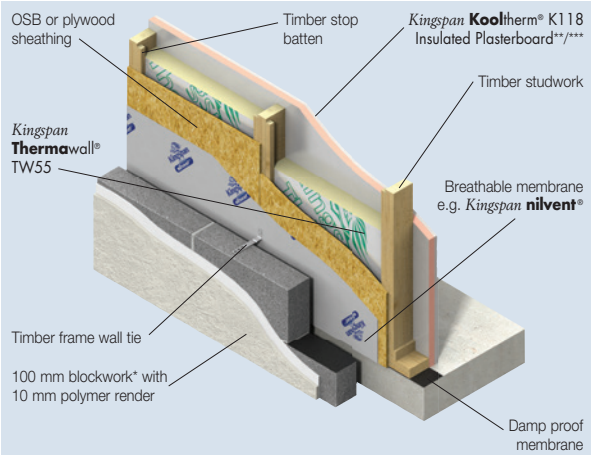



Figure 4

| U–values (W/m²·K) for Various Thicknesses of Insulation, Stud Depths, and Breathable Membranes | | | | |
|---|---|---|---|---|
| Thickness of *Kingspan* **Therma**wall® TW55 Between Studs (mm) | Product Thickness of *Kingspan* **Kool**therm® K118 Insulated Plasterboard**** Inside Studs (mm) | Breathable Membrane Type | | |
| | | Standard | Foil Faced | Foil Faced Bubble |
| **89 mm Deep Timber Studs** | | | | |
| 25 | 0** | ✗ | ✗ | ✗ |
| 30 | 0** | ✗ | ✗ | 0.35 |
| 35 | 0** | ✗ | ✗ | 0.33 |
| 40 | 0** | ✗ | 0.34 | 0.32 |
| 50 | 0** | ✗ | 0.32 | 0.29 |
| 55 | 0** | 0.34 | 0.30 | 0.28 |
| 60 | 0** | 0.33 | 0.29 | 0.27 |
| 70 | 0** | 0.31 | 0.28 | 0.26 |
| 70 | 32.5 | 0.23 | 0.21 | 0.20 |
| 70 | 37.5 | 0.21 | 0.20 | 0.19 |
| 70 | 42.5 | 0.20 | 0.19 | 0.18 |
| 70 | 52.5 | 0.18 | 0.17 | 0.16 |
| 70 | 57.5 | 0.17 | 0.16 | 0.15 |
| 70 | 62.5 | 0.16 | 0.15 | 0.15 |
| 70 | 72.5 | 💧 | 💧 | 💧 |
| 70 | 77.5 | 💧 | 💧 | 💧 |
| **140 mm Deep Timber Studs** | | | | |
| 25 | 0** | ✗ | ✗ | ✗ |
| 30 | 0** | ✗ | ✗ | 0.34 |
| 35 | 0** | ✗ | 0.35 | 0.32 |
| 40 | 0** | ✗ | 0.33 | 0.31 |
| 45 | 0** | ✗ | 0.32 | 0.29 |
| 50 | 0** | 0.34 | 0.30 | 0.28 |
| 60 | 0** | 0.31 | 0.28 | 0.26 |
| 70 | 0** | 0.29 | 0.26 | 0.24 |
| 75 | 0** | 0.28 | 0.25 | 0.23 |
| 80 | 0** | 0.27 | 0.24 | 0.23 |
| 90 | 0** | 0.25 | 0.23 | 0.22 |
| 100 | 0** | 0.24 | 0.22 | 0.20 |
| 110 | 0** | 0.23 | 0.21 | 0.19 |
| 120 | 0** | 0.22 | 0.20 | 0.18 |
| 120 | 32.5 | 0.17 | 0.16 | 0.15 |
| 120 | 37.5 | 0.16 | 0.15 | 0.15 |
| 120 | 42.5 | 0.15 | 0.15 | 0.14 |
| 120 | 52.5 | 0.14 | 0.13 | 0.13 |

### Insulation Between Timber Frame Studs and Insulated Sheathing

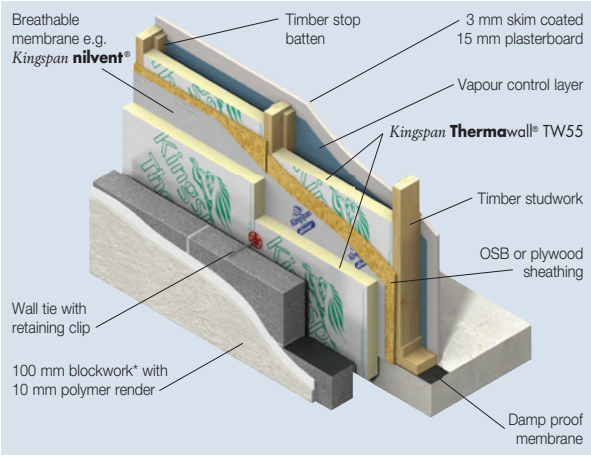



Figure 5

| U–values for Various Thicknesses of Insulation and Stud Depths | |
|---|---|
| Thickness of *Kingspan* **Therma**wall® TW55 (mm) | U–values (W/m²·K) |
| **89 mm Deep Timber Studs** | |
| 20 + 20 | 0.30 |
| 25 + 25 | 0.27 |
| 30 + 30 | 0.24 |
| 40 + 40 | 0.20 |
| 50 + 50 | 0.18 |
| 60 + 60 | 0.16 |
| 70 + 70 | 0.14 |
| **140 mm Deep Timber Frame Studs** | |
| 20 + 20 | 0.29 |
| 25 + 25 | 0.26 |
| 30 + 30 | 0.24 |
| 40 + 40 | 0.20 |
| 50 + 50 | 0.17 |
| 60 + 60 | 0.15 |
| 70 + 70 | 0.14 |

* *Calculations assume Dense Block of λ–value 1.13 W/m·K.*

NB *Refer to local distributor or Kingspan Insulation price list for current stock and non–stock sizes.*

* *Calculations assume dense block of λ–value 1.13 W/m·K.*

** *Calculations which feature insulation between studwork only, assume the use of 15 mm plasterboard and a polythene sheet vapour control layer in order to minimise the risk of condensation (see 'Design Considerations – Water Vapour Control').*

*** *Kingspan* **Kool**therm® K118 Insulated Plasterboard *contains an integral vapour control layer (see 'Design Considerations – Water Vapour Control').*

**** *Product thicknesses = insulant thickness + 12.5 mm plasterboard.*

NB *Refer to local distributor or Kingspan Insulation price list for current stock and non–stock sizes.*

# Insulated Sheathing

## Insulated Sheathing on Steel Frame

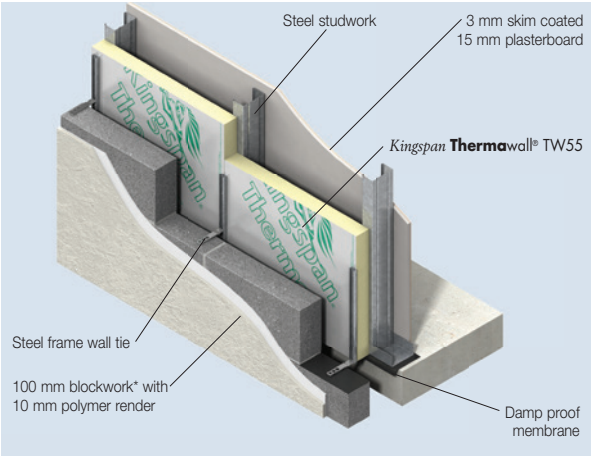



Figure 6

| U–values (W/m²·K) for Various Thicknesses of Insulation, Stud Depths, and External Masonry Types | | |
|---|---|---|
| Thickness of *Kingspan* **Thermawall®** TW55 (mm) | External Masonry | |
| | 102.5 mm Brickwork | Rendered 100 mm Medium Dense Block* |
| **100 mm Deep Steel Frame at 600 centres** | | |
| 25 | ✗ | 0.35 |
| 30 | 0.34 | 0.33 |
| 35 | 0.32 | 0.30 |
| 40 | 0.30 | 0.28 |
| 45 | 0.28 | 0.27 |
| 50 | 0.26 | 0.25 |
| 60 | 0.23 | 0.23 |
| 65 | 0.22 | 0.21 |
| 70 | 0.21 | 0.20 |
| 75 | 0.20 | 0.20 |
| 80 | 0.19 | 0.19 |
| 90 | 0.18 | 0.17 |
| 100 | 0.16 | 0.16 |
| 110 | 0.15 | 0.15 |
| 120 | 0.15 | 0.14 |
| 125 | 0.14 | 0.14 |
| **150 mm Deep Steel Frame at 600 centres** | | |
| 25 | ✗ | 0.35 |
| 30 | 0.34 | 0.32 |
| 35 | 0.31 | 0.30 |
| 40 | 0.29 | 0.28 |
| 45 | 0.27 | 0.26 |
| 50 | 0.26 | 0.25 |
| 60 | 0.23 | 0.22 |
| 65 | 0.22 | 0.21 |
| 70 | 0.21 | 0.20 |
| 75 | 0.20 | 0.19 |
| 80 | 0.19 | 0.19 |
| 90 | 0.18 | 0.17 |
| 100 | 0.16 | 0.16 |
| 110 | 0.15 | 0.15 |
| 120 | 0.15 | 0.14 |
| 125 | 0.14 | 0.14 |

* *Calculations assume medium dense block of λ–value 0.51 W/m·K, with 10 mm polymer render.*

NB *Refer to local distributor or Kingspan Insulation price list for current stock and non–stock sizes.*

## Insulated Sheathing on Timber Frame

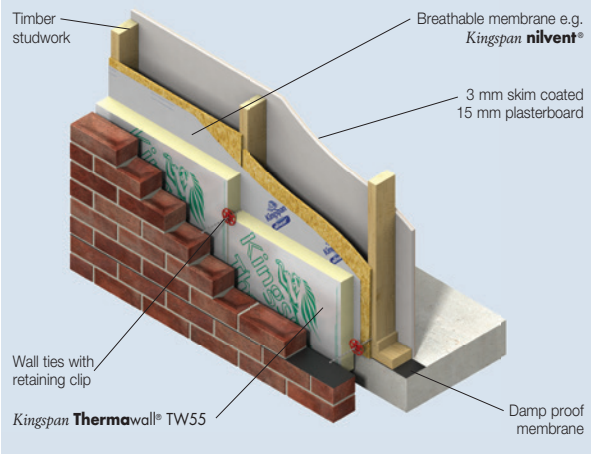



Figure 7

| U–values (W/m²·K) for Various Thicknesses of Insulation, Stud Depths, and External Masonry Types | | |
|---|---|---|
| Thickness of *Kingspan* **Thermawall®** TW55 (mm) | External Masonry | |
| | 102.5 mm Brickwork | Rendered 100 mm Medium Dense Block* |
| **89 mm Deep Timber Studs** | | |
| 25 | ✗ | ✗ |
| 30 | ✗ | 0.35 |
| 35 | 0.34 | 0.32 |
| 40 | 0.31 | 0.30 |
| 45 | 0.29 | 0.28 |
| 50 | 0.27 | 0.26 |
| 60 | 0.24 | 0.23 |
| 65 | 0.23 | 0.22 |
| 70 | 0.22 | 0.21 |
| 75 | 0.21 | 0.20 |
| 80 | 0.20 | 0.19 |
| 90 | 0.18 | 0.18 |
| 100 | 0.17 | 0.16 |
| 110 | 0.16 | 0.15 |
| 120 | 0.15 | 0.14 |
| **140 mm Deep Timber Studs** | | |
| 25 | ✗ | ✗ |
| 30 | ✗ | 0.34 |
| 35 | 0.33 | 0.32 |
| 40 | 0.31 | 0.30 |
| 45 | 0.29 | 0.28 |
| 50 | 0.27 | 0.26 |
| 60 | 0.24 | 0.23 |
| 65 | 0.23 | 0.33 |
| 70 | 0.22 | 0.21 |
| 75 | 0.21 | 0.20 |
| 80 | 0.20 | 0.19 |
| 90 | 0.18 | 0.18 |
| 100 | 0.17 | 0.16 |
| 110 | 0.16 | 0.15 |
| 120 | 0.15 | 0.14 |

* *Calculations assume medium dense block of λ–value 0.51 W/m·K, with 10 mm polymer render.*

NB *Refer to local distributor or Kingspan Insulation price list for current stock and non–stock sizes.*

# Design Considerations

## Heat Loss and Linear Thermal Bridging

**Basic Principles**

When insulation is installed between a timber or steel frame, the effect of repeating thermal bridges (frame, studwork or noggins) that bridge the insulation layer with poorer conductivity materials, must be considered. For a typical timber frame wall, this can represent up to or over 15% of the internal surface area of the building, which will significantly affect the overall U–value. The effect of this bridging can be reduced or avoided by installing an additional layer of insulation either to the internal side of the frame, or sheathing the construction on the cold side.

Linear thermal bridging describes the additional heat losses or gains that occur at junctions between elements e.g. where a timber framed wall meets the ground or intermediate floor, or at junctions around openings in the building fabric where the thermal insulation layer is discontinuous e.g. sills, jambs and lintels.

Interruptions within the insulation layer by materials with poorer insulating properties can result in a thermal bridge, which in turn can lead to problems of internal surface condensation and mould growth, especially if there is a drop in surface temperature.

The heat flow at these junctions and opening locations, over and above that through the adjoining plane elements, is the linear thermal transmittance of the thermal bridge: measured in W/m·K; referred to as a 'psi–value'; and expressed as a 'ψ–value'.

The lower the ψ–value, the better the performance. ψ–values are taken into account in the calculation methodologies e.g. the Standard Assessment Procedure (SAP) that are used to assess the operational $CO_2$ emissions and, where applicable, the fabric energy efficiency of buildings.

ψ–values can comprise either, or a combination of, approved, calculated or assumed values.

Approved details, such as the Accredited Construction Details (England & Wales / Scotland / Northern Ireland) and Acceptable Construction Details (Republic of Ireland), collectively referred to here as ACDs, can uplift performance to provide a clear starting point towards achieving compliance, but they are limited in scope and applicability. The greatest opportunity for mitigating the impact of linear thermal bridges can come from following accurately 'modelled' details that take into account the following design considerations.

**Reducing Linear Thermal Bridging**

Detailing at junctions to minimise the effects of thermal bridging and the associated risk of condensation or mould growth is important and there are some simple design considerations that can be adopted to help mitigate the risks and to reduce heat losses.

- Care is required to ensure continuation of insulation wherever possible for best thermal performance. Where this is not possible, insulation layers should be overlapped and, ideally, insulation material introduced between.
- The best approach to minimise cold bridging from junctions is to sheath the frame construction and junctions externally with *Kingspan* **Therma**wall® TW55.
- An internal lining of insulation on the warm side of the construction, such as *Kingspan* **Kool**therm® K118 Insulated Plasterboard, can also help to reduce heat losses; alternatively, localised losses can be minimised using a thin insulation layer behind the internal wall lining adjacent to the soleplate.
- Prevention of thermal bridging should be considered when designing sills, jambs and lintels. An insulated cavity closer e.g. *Kingspan* **Kool**therm® Cavity Closer or *Kingspan* **Kool**therm® Cavity Closer **PLUS** is available from Kingspan Insulation. Please refer to the literature for these products for further information. This literature is available from the Kingspan Insulation Marketing Department or via the Kingspan Insulation website (see rear cover for details).
- Heat–loss from junctions around window or door openings can be further reduced by insulating the reveal. The key factor is the thermal resistance (R–value) of the insulation layer. Reveals should be designed to accommodate 32.5 mm (min.) of *Kingspan* **Kool**therm® K118 Insulated Plasterboard.
- The application of internal insulation above and below an intermediate or separating floor reduces the overall heat loss through the wall, but can increase the losses through the junction; to reduce this heat loss, a minimum thickness of 150 mm of insulation should be included within the intermediate / separating floor void adjacent to the rim–board. The intermediate or separating floor junction heat–losses can also be addressed through insulated sheathing with *Kingspan* **Therma**wall® TW55 on the cold side of the frame.

- In order to minimise cold bridging at the edge of ground floors, the distance between the top surface of the floor insulation or perimeter insulation upstand, and the bottom of the wall insulation must be a minimum of 150 / 225* mm. The further appropriate wall insulation extends past the floor insulation, the better the thermal performance of the junction between the wall and the floor.

* *150 mm applies to the UK and 225 mm to the Republic of Ireland.*

- For junctions between the external walls and roof constructions, continuity and overlap of insulation layers is the key to minimising heat losses from the junctions. Refer to *Kingspan* **Kool**therm® K107 Pitched Roof Board literature for further design considerations.

For further advice on details to reduce linear thermal bridging please contact the Kingspan Insulation Technical Service Department (see rear cover for details).

## Environmental Impact & Responsible Sourcing

### Green Guide Rating

An Ecoprofile, certified by BRE Certification to the 2008 BRE Environmental Profiles Methodology, has been created for *Kingspan* **Therma**wall® TW55 produced at Kingspan Insulation's British manufacturing facilities. The BRE has assigned the product a 2008 Green Guide Summary Rating of A+.

Environmental Profiles Scheme
Certificate Number ENP 500

### Responsible Sourcing

*Kingspan* **Therma**wall® TW55 produced at Kingspan Insulation's Pembridge manufacturing facility is certified to BES 6001 (Framework Standard for the Responsible Sourcing of Construction Products) 'Excellent'.

*Kingspan* **Therma**wall® TW55 is manufactured under a management system certified to ISO 14001: 2004.

*NB The above information is correct at the time of writing. Please confirm at the point of need by contacting Kingspan Insulation's Technical Service Department (see rear cover), from which copies of Kingspan Insulation's certificates can be obtained along with confirmation of Kingspan Insulation's products' Green Guide ratings.*

## 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 operations at its Pembridge, Herefordshire and Selby, North Yorkshire manufacturing facilities is available at www.kingspaninsulation.co.uk/sustainabilityandresponsibility.

## Specification Clause

*Kingspan* **Therma**wall® TW55 should be described in specifications as:–

The stud wall insulation shall be *Kingspan* **Therma**wall® TW55 ____ mm thick: comprising a high performance rigid thermoset insulation core faced on both sides with a low emissivity composite foil facing. The product shall be manufactured: with a blowing agent that has zero Ozone Depletion Potential (ODP) and low Global Warming Potential (GWP); in accordance with the requirements of BS 4841–1; under a management system certified to ISO 9001: 2008, ISO 14001: 2004, BS / I.S. OHSAS 18001: 2007 and ISO 50001: 2011; by Kingspan Insulation Limited; and installed in accordance with the instructions issued by them.

# Design Considerations

## NBS Specifications

Details also available in NBS Plus.
NBS users should refer to clause(s):
F30 155, P10 210, K11 495
(Standard and Intermediate)
F30 12, P10 40 (Minor Works).

## Building Information Modelling (BIM)

Kingspan Insulation's BIM objects can be downloaded in Revit and in IFC formats. For more information please visit www.kingspaninsulation.co.uk/bim.

## Water Vapour Control / Condensation

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

Condensation can be controlled, in constructions containing *Kingspan* **Therma**wall® TW55, 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* **Kool**therm® K118 Insulated Plasterboard, which contains an integral vapour control layer*, the use of a layer of polythene sheeting*, or by the application of two coats of Gyproc Drywall Sealer.

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

A condensation risk analysis should be carried out following the procedures set out in BS 5250: 2011 + A1: 2016 (Code of practice for the control of condensation in buildings). The Kingspan Insulation Technical Service Department (see rear cover) can provide this service.

## Fire Stops

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

## Lightning Protection

Building designers should give consideration to the requirements of BS / I.S. EN 62305: 2011 (Protection against lightning).

# Sitework

## Introduction

- Installation advice, for different applications of *Kingspan* **Therma**wall® TW55, is listed below. Where constructions include a combination of applications, e.g. 'Insulation Between Timber Frame Studs and Insulated Sheathing', refer to both relevant sections. Regardless of whether insulation is being installed between and outside, or between and inside timber studs, the two layers should always be fixed so that there are no air spaces between them in construction.

## External Masonry

**Timber Frame Wall with Insulation Between Studs**

- ***If insulation boards are to be fitted so that they are flush with the inside surface of the timber studs***, nail treated softwood battens to the side of the studs, to provide a 'stop' to prevent the insulation boards from moving within the stud cavity.
- This 'stop' should be positioned to allow the insulation boards to finish flush with the inside surface of the studs.
- Insulation boards may be temporarily held to the 'stop' battens with large headed clout nails.
- The boards will be further restrained by the plasterboard / insulated plasterboard lining, fixed to the inside face of the studs.
- To avoid air leakage, any penetrations through the insulation (electrical sockets, plumbing and wiring etc) should be sealed with flexible sealant or equivalent, or a combination of flexible polyurethane foam and flexible sealant or equivalent.
- Any remaining gaps between boards / sheets of insulation should be filled with flexible sealant or equivalent, or a combination of flexible polyurethane foam and flexible sealant or equivalent.
- ***If the insulation boards are to be fitted so that they are flush with the outside surface of the timber studs*** (tight up against the pre–installed OSB or plywood sheathing), insulation boards must be cut and fitted in the spaces between the studs.
- Once the boards are fitted in place, nail treated softwood battens to the side of the studs, to provide a 'stop' to prevent the insulation boards from moving within the stud cavity.

- ***When utilising** Kingspan* **Therma**wall® TW55 ***between studwork with no insulated sheathing***, a vapour control layer should be installed. This can be provided by vapour check plasterboard*, *Kingspan* **Kool**therm® K118 Insulated Plasterboard*, the use of a layer of polythene sheeting*, or by the application of two coats of Gyproc Drywall Sealer.

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

- ***In all cases***, measure the distance between studs before cutting *Kingspan* **Therma**wall® TW55 to size, as spacings can vary.
- Ensure there is a tight fit between the boards and the adjoining studs and other timbers, and fill all gaps with expanding urethane sealant.
- Ensure that the boards are lightly butted, and continuity of insulation is maintained.
- The outer leaf of masonry may be constructed in the conventional manner, using appropriate wall ties to hold the two wall leaves together.

**Timber Frame Wall with Insulating Sheathing**

- *Kingspan* **Therma**wall® TW55 should be fixed to the external surface of the timber frame structure (outside of any breathable membrane, OSB or plywood sheathing), and restrained in accordance with the timber frame manufacturers recommendations. However, in the absence of other guidance please note the following.
- Ensure that the boards are lightly butted and continuity of insulation is maintained.
- Large headed galvanised clout nails may be used as temporary fixings prior to the insulation boards being tied into the masonry leaf with an appropriate timber frame wall tie.
- Always ensure that fixings are coincident with the underlying timber studs, head rails and sole plates.
- The outer leaf of masonry may be constructed in the conventional manner, using appropriate wall ties to hold the two wall leaves together.

**Timber Frame Wall Tie Manufacturers**

| | |
|---|---|
| Ancon Building Products<br>www.ancon.co.uk | +44 (0) 1142 755 224 |
| Cullen<br>www.cullen–bp.co.uk | +44 (0) 1592 771 132 |
| Helifix Limited<br>www.helifix.co.uk | +44 (0) 2087 355 222 |
| MAK Fasteners<br>www.makfasteners.com | +353 (0) 1 451 99 00 |
| Simpsons<br>www.strongtie.co.uk | +44 (0) 1827 255 600 |

**Steel Frame Wall with Insulating Sheathing**

- *Kingspan* **Therma**wall® TW55 should be fixed to the outside of the steel frame construction, ensuring vertical board joints coincide with a vertical steelwork member.
- Fixings should be in accordance with the steel frame manufacturer's recommendations.
- Ensure that the boards are lightly butted and continuity of insulation is maintained.
- Advice should be sought from the appropriate steel frame manufacturer, for recommendations on suitable wall tie specification. In the absence of any other guidance refer to:

  Ancon Building Products +44 (0) 1142 755 224
  www.ancon.co.uk

# Sitework

## Internal Dry Lining with Insulation Between Timber Framework

- The timber framework, backed with strips of damp proof course (DPC), should be mechanically fixed to the masonry wall.
- The timbers should be deep enough to accommodate the required thickness of insulation and a 25 mm (min.) air space between the insulation and the masonry.
- To avoid insulation boards moving within the timber framework cavity, nail treated softwood battens to the side of the timber members to provide a 'stop'.
- This 'stop' should be positioned to allow the insulation boards to finish flush with the inner surface of the timbers.
- Measure the distance between timber members before cutting *Kingspan* **Therma**wall® TW55 as spacings can vary.
- Insulation boards may be temporarily held to the 'stop' battens with large headed clout nails.
- Ensure there is a tight fit between the boards and the adjoining timbers, and fill all gaps with expanding urethane sealant.
- The boards will be further restrained by the plasterboard / insulated plasterboard lining, fixed to the inside face of the timbers.
- To avoid air leakage, any penetrations through the insulation (electrical sockets, plumbing and wiring etc) should be sealed with flexible sealant or equivalent, or a combination of flexible polyurethane foam and flexible sealant or equivalent.
- Any remaining gaps between boards / sheets of insulation should be filled with flexible sealant or equivalent, or a combination of flexible polyurethane foam and flexible sealant or equivalent.
- When utilising *Kingspan* **Therma**wall® TW55 between timbers, a vapour control layer should be installed. This can be provided by vapour check plasterboard*, *Kingspan* **Kool**therm® K118 Insulated Plasterboard*, the use of a layer of polythene sheeting*, or by the application of two coats of Gyproc Drywall Sealer.

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

## Inside Studs / Timbers Layer of Insulation

- Please refer to the literature for *Kingspan* **Kool**therm® K118 Insulated Plasterboard for fixing instructions. This literature is available from the Kingspan Insulation Marketing Department or from the Kingspan Insulation website (see rear cover for details).

## General

### Cutting

- Cutting should be carried out either by using a fine toothed saw, or by scoring with a sharp knife, snapping the board over a straight edge and then cutting the facing on the other side.
- Ensure accurate trimming to achieve close butting joints and continuity of insulation.

### Daily Working Practice

- At the completion of each day's work, or whenever work is interrupted for extended periods of time, board edges and joints should be protected from inclement weather.

### Availability

- *Kingspan* **Therma**wall® TW55 is available through specialist insulation distributors and selected builders' merchants throughout the UK and Ireland.

### Packaging and Storage

- The polyethylene packaging of Kingspan Insulation products, which is recyclable, should not be considered adequate for outdoor protection.
- Ideally, boards should be stored inside a building. If, however, outside storage cannot be avoided, then the boards should be stacked clear of the ground and covered with an opaque polythene sheet or weatherproof tarpaulin. Boards that have been allowed to get wet should not be used.

### Health and Safety

- Kingspan Insulation products are chemically inert and safe to use.
- A Safety Information Data Sheet for this product is available from the Kingspan Insulation website www.kingspaninsulation.co.uk/safety or www.kingspaninsulation.ie/safety.

*Please note that the reflective surfaces on this product are designed to enhance its thermal performance. As such, they will reflect light as well as heat, including ultraviolet light. Therefore, if this product is being installed during very bright or sunny weather, it is advisable to wear UV protective sunglasses or goggles, and if the skin is exposed for a significant period of time, to protect the bare skin with a UV block sun cream.*

*The reflective facings used on this product can be slippery when wet. Therefore, it is recommended that any excess material should be contained to avoid a slip hazard.*

*Warning – do not stand on or otherwise support your weight on this product unless it is fully supported by a load bearing surface.*

# Product Details

## The Facings

*Kingspan* **Therma**wall® TW55 is faced on both sides with a low emissivity composite foil, autohesively bonded to the insulation core during manufacture. This reflective, low emissivity surface improves the thermal resistance of any unventilated cavity adjacent to the board.

## The Core

The core of *Kingspan* **Therma**wall® TW55 is manufactured with **Nilflam**® technology, a high performance fibre–free rigid thermoset polyisocyanurate (PIR) insulant manufactured with a blowing agent that has zero Ozone Depletion Potential (ODP) and low Global Warming Potential (GWP).

## Standards and Approvals

*Kingspan* **Therma**wall® TW55 is manufactured to the highest standards in accordance with BS 4841–1 Rigid polyisocyanurate (PIR) and polyurethane (PUR) products for building end–use applications. Specification for laminated insulation boards with auto–adhesively or separately bonded facings).

*Kingspan* **Therma**wall® TW55 is also manufactured to the highest standards under a management system certified to ISO 9001: 2008 (Quality management systems. Requirements), ISO 14001: 2004 (Environmental Management Systems. Requirements), BS / I.S OHSAS 18001: 2007 (Occupational Health and Safety Management Systems. Requirements) and ISO 50001: 2011 (Energy Management Systems. Requirements with Guidance for Use).

The use of *Kingspan* **Therma**wall® TW55 produced at Kingspan Insulation's Pembridge and Selby manufacturing facilities is covered by BBA Certificate 14/5133, and that produced at Kingspan Insulation's Castleblayney manufacturing facility by NSAI Agrément Certificate 03/0196.

## Standard Dimensions

*Kingspan* **Therma**wall® TW55 is available in the following standard size(s):

| Nominal Dimension | | Availability |
|---|---|---|
| Length | (m) | 2.4 |
| Width | (m) | 1.2 |
| Insulant Thickness | (mm) | Refer to local distributor or Kingspan Insulation price list for current stock and non–stock sizes. |

## Compressive Strength

The compressive strength of *Kingspan* **Therma**wall® TW55 typically exceeds 140 kPa at 10% compression, when tested to BS / I.S. EN 826: 2013 (Thermal insulating products for building applications. Determination of compression behaviour).

## Water Vapour Resistance

Adjusted for the effect of board joints, the product typically achieves a resistance far greater than 100 MN·s/g, when tested in accordance with BS / I.S. EN 12086: 2013 (Thermal insulating products for building applications. Determination of water vapour transmission properties).

## Durability

If correctly installed, *Kingspan* **Therma**wall® TW55 can have an indefinite life. Its durability depends on the supporting structure and the conditions of its use.

## Resistance to Solvents, Fungi & Rodents

The insulation core is resistant to short–term contact with petrol and with most dilute acids, alkalis and mineral oils. However, it is recommended that any spills be cleaned off fully before the boards are installed. Ensure that safe methods of cleaning are used, as recommended by the suppliers of the spilt liquid. The insulation core 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 this product. Damaged boards or boards that have been in contact with harsh solvents or acids should not be used.

The insulation core and facings used in the manufacture of *Kingspan* **Therma**wall® TW55 resist attack by mould and microbial growth, and do not provide any food value to vermin.

# Product Details

## Fire Performance

*Kingspan* **Therma**wall® TW55 can be used in multi storey buildings up to 18 metres in height. For buildings over 18 metres, please refer to the full product literature for *Kingspan* **Kool**therm® K15 Rainscreen Board. This literature is available from the Kingspan Insulation Marketing Department or via the Kingspan Insulation website (see rear cover for details).

*Kingspan* **Therma**wall® TW55 is Class 1, as defined by BS 476–7: 1997 (Fire tests on building materials and structures. Method of test to determine the classification of the surface spread of flame of products).

*Kingspan* **Therma**wall® TW55 in the constructions 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 results shown.

| Construction | Result |
|---|---|
| 12.5 mm plasterboard, 60 mm *Kingspan* **Therma**wall® TW55 between 89 x 38 mm timber studs @ 600 mm centres and 11 mm OSB sheathing. | Passed half hour test. |
| 12.5 mm fire resistant wall board, 12.5 mm plasterboard, 60 mm *Kingspan* **Therma**wall® TW55 between 89 x 38 mm timber studs @ 600 mm centres and 10 mm OSB sheathing. | Passed one hour test. |
| 12.5 mm fire resistant wall board, 75 x 43 mm metal studs @ 600 mm centres and 35 mm *Kingspan* **Therma**wall® TW55 as sheathing. | Passed half hour test. |

*Kingspan* **Therma**wall® TW55 in the construction specified in the table below, when subjected to British Standard fire test BS 476–22: 1987 (Fire tests on building materials and structures. Methods for determination of the fire resistance of non–loadbearing elements of construction), has achieved the result shown.

| Construction | Result |
|---|---|
| 12.5 mm fire resistant wall board, 12.5 mm plasterboard, 100 mm deep metal studs @ 600 mm centres and 45 mm *Kingspan* **Therma**wall® TW55 as sheathing. | Passed one hour test |

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

## Thermal Properties

The λ–values and R–values detailed below are quoted in accordance with BS / I.S. EN 13165: 2012 + A1: 2015 (Thermal insulation products for buildings – Factory made rigid polyurethane foam (PUR) products – Specification).

### Thermal Conductivity

The boards achieve a thermal conductivity (λ–value) of 0.022 W/m·K.

### Thermal Resistance

Thermal resistance (R–value) varies with thickness and is calculated by dividing the thickness of the board (expressed in metres) by its thermal conductivity. The resulting number is rounded down to the nearest 0.05 ($m^2$·K/W).

| Insulant Thickness (mm) | Thermal Resistance ($m^2$·K/W) |
|---|---|
| 20 | 0.90 |
| 25 | 1.10 |
| 30 | 1.35 |
| 35 | 1.55 |
| 40 | 1.80 |
| 45 | 2.00 |
| 50 | 2.25 |
| 55 | 2.50 |
| 60 | 2.70 |
| 65 | 2.95 |
| 70 | 3.15 |
| 75 | 3.40 |
| 80 | 3.60 |
| 90 | 4.05 |
| 100 | 4.50 |
| 110 | 5.00 |
| 120 | 5.45 |
| 125 | 5.65 |
| 140 | 6.35 |
| 160 | 7.25 |

*NB Refer to local distributor or Kingspan Insulation price list for current stock and non–stock sizes.*

# Kingspan Insulation

## Company Details

Kingspan Insulation Ltd is part of the Kingspan Group plc., one of Europe's leading construction product manufacturers. The Kingspan Group was formed in the late 1960s and is a publicly quoted group of companies headquartered in Kingscourt, County Cavan, Ireland.

Kingspan Insulation Ltd is a market leading manufacturer of premium and high performance rigid insulation products and insulated systems for building fabric and building services applications.

## Products & Applications

Kingspan Insulation Ltd has a vast product range. Kingspan Insulation Ltd products are suitable for both new build and refurbishment in a variety of applications within both domestic and non–domestic buildings.

**Insulation for:**

- Pitched Roofs
- Flat Roofs
- Green Roofs
- Cavity Walls
- Solid Walls
- Timber and Steel Framing
- Insulated Cladding Systems
- Insulated Render Systems
- Floors
- Soffits
- Ductwork

**Further Solutions:**

- Insulated Dry–Lining
- Tapered Roofing Systems
- Cavity Closers
- *Kingspan* **Kool**Duct® Pre–Insulated Ducting
- *Kingspan* **nilvent**® Breathable Membranes
- *Kingspan* **TEK**® Building System

## Insulation Product Benefits

*Kingspan* OPTIM-R® Vacuum Insulation Panel (VIP) **Products**

- With a declared value thermal conductivity of 0.007 W/m·K, these products provide an insulating performance that is up to five times better than commonly used insulation materials.
- Provides high levels of thermal efficiency with minimal thickness.
- Over 90% (by weight) recyclable.

*Kingspan* **Kool**therm® Range **Products**

- With a thermal conductivity of 0.018–0.023 W/m·K these are the most thermally efficient insulation products commonly used.
- The thinnest commonly used insulation products for any specific U–value.
- Manufactured with a blowing agent that has zero Ozone Depletion Potential (ODP) and low Global Warming Potential (GWP).

*Kingspan* **Therma**™ Range **Products**

- With a thermal conductivity of 0.022–0.028 W/m·K these are amongst the more thermally efficient insulation products commonly used.
- Manufactured with a blowing agent that has zero Ozone Depletion Potential (ODP) and low Global Warming Potential (GWP).

*Kingspan* **Styr**ozone® Range **Products**

- Rigid extruded polystyrene insulation (XPS) has the necessary compressive strength to make it the product of choice for specialist applications such as heavy duty flooring, car park decks and inverted roofing.
- Manufactured with a blowing agent that has zero Ozone Depletion Potential (ODP).

**All Products**

- Unaffected by air infiltration – a problem that can be experienced with mineral fibre and which can reduce thermal performance.
- Safe and easy to install.
- If installed correctly, can provide reliable long term thermal performance over the lifetime of the building.
- Each product achieves the required fire performance for its intended application.

# 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@kingspaninsulation.co.uk

Ireland – Tel: +353 (0) 42 979 5000
– Fax: +353 (0) 42 975 4299
– email: info@kingspaninsulation.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.

For copies please contact the Kingspan Insulation Marketing Department, or visit the Kingspan Insulation website, using the details below:

UK – Tel: +44 (0) 1544 387 384
– Fax: +44 (0) 1544 387 484
– email: literature@kingspaninsulation.co.uk
– www.kingspaninsulation.co.uk/literature

Ireland – Tel: +353 (0) 42 979 5000
– Fax: +353 (0) 42 975 4299
– email: info@kingspaninsulation.ie
– www.kingspaninsulation.ie/literature

## Tapered Roofing

For technical guidance, quotations, order placement and details of despatches please contact the Kingspan Insulation Tapered Roofing Department on the numbers below:

UK – Tel: +44 (0) 1544 387 383
– Fax: +44 (0) 1544 387 483
– email: tapered@kingspaninsulation.co.uk

Ireland – Tel: +353 (0) 42 975 4297
– Fax: +353 (0) 42 975 4296
– email: tapered@kingspaninsulation.ie

## Technical Advice / Design

Kingspan Insulation supports all of its products with a comprehensive Technical Advisory Service. Calculations can be carried out to provide U–values, condensation / dew point risk, required insulation thicknesses etc…

U–value calculations can also be carried out on the Kingspan Insulation U–value Calculator, available for free online at www.uvalue-calculator.co.uk or downloaded as an App.

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.

BBA CERTIFICATE CS/1004-4
U Value Competency Scheme

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@kingspaninsulation.co.uk

Ireland – Tel: +353 (0) 42 975 4297
– Fax: +353 (0) 42 975 4296
– email: technical@kingspaninsulation.ie

## 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@kingspaninsulation.co.uk

Ireland – Tel: +353 (0) 42 979 5000
– Fax: +353 (0) 42 975 4299
– email: info@kingspaninsulation.ie

*Kingspan Insulation Ltd. reserves the right to amend product specifications without prior notice. Product thicknesses shown in this document should not be taken as being available ex–stock and reference should be made to the current Kingspan Insulation price–list or advice sought from Kingspan Insulation's Customer Service Department (see above left). 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 Insulation offers a Technical Advisory Service (see above), the advice of which should be sought for uses of Kingspan Insulation 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 left).*

Kingspan®

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