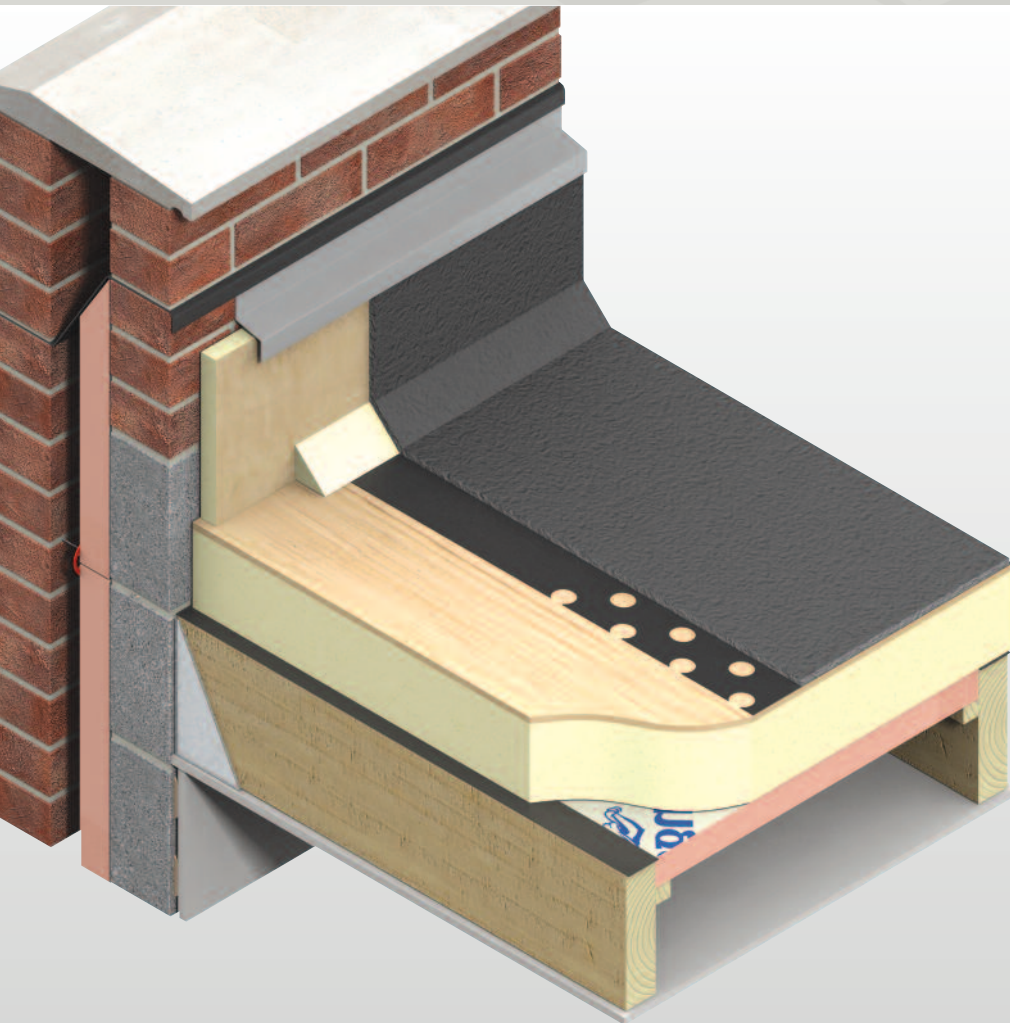




# Thermarroof® TR3 1

STRUCTURAL INSULATION / FSC CERTIFIED PLYWOOD COMPOSITE FOR FLAT ROOFS WATERPROOFED WITH PARTIALLY BONDED BUILT-UP FELT



- High performance rigid thermoset insulation – thermal conductivity 0.022 W/m-K
- Insulation, vapour control layer and decking in one board
- Proven reputation as a quality composite roof deck
- Resistant to the passage of water vapour
- Easy to handle and install
- Ideal for new build and refurbishment
- Non-deleterious material
- Manufactured with a blowing agent that has zero ODP and low GDP



*Low Energy –  
Low Carbon Buildings*

# 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). They are valid for the constructions shown in the detail immediately above each table.



These examples are based on **Kingspan Thermaroof® TR31**, mechanically fixed to 150 mm timber roof joists at the centres shown, waterproofed using partially bonded built-up felt with the surface covered with mineral chippings. The ceiling is taken to be a 3 mm skim coated 12.5 mm plasterboard (of type shown in the examples) with a non-ventilated low emissivity cavity between it and the underside of the deck.

*NB When calculating U-values to BS / I.S. EN ISO 6946: 2007, the type of mechanical fixing used may change the thickness of insulation. Calculations assume the use of stainless steel oval headed fixings with a cross sectional area of 12.32 mm².*

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

## U-value Table Key

Where an **X** is shown, the U-value is higher than the worst of the maximum new build area weighted average U-values allowed by the 2010 Editions of Approved Documents L to the Building Regulations (England & Wales), the 2010 Editions of Technical Handbooks Section 6 (Scotland), the 2006 Editions of Technical Booklets F (Northern Ireland), or the 2008 Editions of Technical Guidance Documents L\* (Republic of Ireland).

\* Excluding Change of Use and Material Alterations.

## Timber Deck

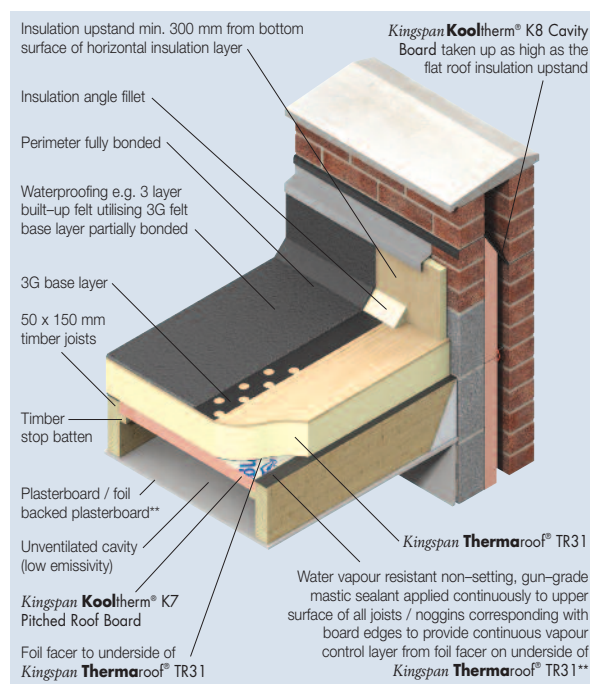


Figure 1

Thickness Kingspan Kooltherm® K7 Pitched Roof Board (mm)	Product Thickness of Kingspan Thermaroof® TR31* (mm)	U-values (W/m²·K)	
		400	600
0	81	X	X
0	86	0.25	0.25
0	91	0.24	0.23
0	96	0.23	0.22
0	101	0.22	0.21
0	106	0.21	0.21
0	111	0.20	0.20
0	116	0.19	0.19
0	121	0.18	0.18
20	121	0.16	0.16
25	126	0.15	0.15
35	126	0.15	0.15
45	126	0.14	0.14
50	126	0.14	0.13
55	126	0.13	0.13
60**	126	0.13	0.12
70**	126	0.12	0.12
80**	126	0.12	0.11
90**	126	0.11	0.11
105**	126	0.11	0.10
115**	126	0.10	0.10

\* Product thickness = insulant thickness + 6 mm plywood.

\*\*Where Kingspan Kooltherm® K7 Pitched Roof Board ≥ 60 mm thick is installed between joists the use of mastic sealant over the joists can result in an interstitial condensation risk. In order to avoid this risk, mastic sealant should not be applied over the joists and a separate vapour control layer should be installed. The separate vapour control layer should consist of either a foil backed vapour check plasterboard or a layer of polythene sheeting installed between the plasterboard and the underside of the joists.

# Design Considerations

## Linear Thermal Bridging

Reasonable provision must be made to limit the effects of cold bridging. The design should ensure that roof-light or ventilator kerbs etc. are always insulated with the same thickness of **Kingspan Thermaroof® TR31** as the general roof area. A 25 mm thick **Kingspan Thermaroof® TR27** LPC/FM upstand should be used around the perimeter of the roof on the internal façade of parapets. A minimum distance of 300 mm should be maintained between the top of the insulation upstand and the bottom of the horizontal roof insulation. Wall insulation should also be carried up into parapets as high as the flat roof insulation upstand. Please contact the Kingspan Insulation Technical Service Department (see rear cover) for further advice.

## Environmental Impact & Responsible Sourcing

### Green Guide Rating

An Ecoprofile, certified by BRE Certification to the 2008 BRE Environmental Profiles Methodology, has been created for the insulation component **Kingspan Thermaroof® TR31** 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 409

### Responsible Sourcing

**Kingspan Thermaroof® TR31** is manufactured under a management system certified to BS / I.S. EN ISO 14001: 2004. The principle polymer components of the product are also manufactured under management systems certified to EN ISO 14001: 2004. The plywood component of the product is FSC certified.

*NB The above information is correct at the time of writing. Please confirm the point of need by contacting Kingspan Insulation's Technical Service Department (see rear cover), from which copies of Kingspan Insulation and its suppliers' ISO 14001 and FSC 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 British operations is available at [www.kingspaninsulation.co.uk/sustainabilityandresponsibility](http://www.kingspaninsulation.co.uk/sustainabilityandresponsibility).

## Specification Clause

**Kingspan Thermaroof® TR31** should be described in specifications as:-

The roof insulation shall be **Kingspan Thermaroof® TR31** \_\_\_\_\_mm thick: comprising a high performance rigid thermoset insulation core faced with an FSC certified 6 mm nominal thickness WBP exterior grade plywood on its upper surface and a low emissivity composite foil facing on its lower surface. 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 4841-3 and BS 4841-4; under a management system certified to BS / I.S. EN ISO 9001: 2008, BS / I.S. EN ISO 14001: 2004 and BS / I.S. 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):

J41 420, J41 430 (Standard and Intermediate)

J41 10 (Minor Works)



## Wind Loading

Wind loadings should be assessed in accordance with BS 6399-2: 1997 (Loading for Buildings. Code of practice for wind loads) or BS / I.S. EN 1991-1-4: 2005 (National Annex to Eurocode 1 Actions on Structures. General Actions. Wind Actions) taking into account:

- length / width / height of the building;
- orientation of the building;
- wind speed;
- aspect (e.g. on a hill side); and
- topographical value of the surrounding area.

## Falls

The fall on a flat roof, constructed using *Kingspan Thermaroof*<sup>®</sup> TR31, is normally provided by the supporting structure being directed towards the rainwater outlets. The fall should be smooth and steep enough to prevent the formation of rainwater pools. In order to ensure adequate drainage, BS 6229: 2003 (Flat roofs with continuously supported coverings. Code of practice) recommends uniform gradients of not less than 1 in 80. However, because of building settlement, it is advisable to 'design in' even greater falls. These can be provided by a *Kingspan Thermataper*<sup>®</sup> LPC/FM tapered roofing system. Further details of the *Kingspan Thermataper*<sup>®</sup> LPC/FM range and its supporting design service are available from the Kingspan Insulation Tapered Roofing Department (see rear cover).

## Roof Waterproofing

*Kingspan Thermaroof*<sup>®</sup> TR31 is suitable for use with most bitumen based waterproofing systems including high performance types which incorporate a Type 3G perforated base layer to BS 747: 2000 (Reinforced bitumen sheets for roofing. Specification). The 3G felt layer should be laid dry and loose, mineral face down with a fully bonded perimeter zone. Partially bonded built-up felt waterproofing should be laid, where applicable, in accordance with BS 8217: 2005 (Reinforced bitumen membranes for roofing. Code of practice).

It is possible to use *Kingspan Thermaroof*<sup>®</sup> TR31 with high performance bitumen based waterproofing systems which incorporate 2 layer fully bonded felts. When using *Kingspan Thermaroof*<sup>®</sup> TR31 with fully bonded built-up felt waterproofing, it is recommended that an overlay of 20 mm cork roofboard is fixed to the plywood surface of the sheets of *Kingspan Thermaroof*<sup>®</sup> TR31, using hot bitumen bonding or felt nailing, prior to the installation of the waterproofing. The fibreboard acts as a surface to allow full bonding of the built-up felt. Fully bonded built-up felt waterproofing should be laid, where applicable, in accordance with BS 8217: 2005 (Reinforced bitumen membranes for roofing. Code of practice).

It is also possible to use *Kingspan Thermaroof*<sup>®</sup> TR31 with mastic asphalt waterproofing systems. When using *Kingspan Thermaroof*<sup>®</sup> TR31 with mastic asphalt, it is recommended that an overlay of 20 mm cork roofboard is fixed to the plywood surface of the sheets of *Kingspan Thermaroof*<sup>®</sup> TR31, using hot bitumen bonding or felt nailing, prior to the installation of the waterproofing. The cork roofboard acts as a heat soak for the mastic asphalt. Mastic asphalt waterproofing should be laid, where applicable, in accordance with BS 8218: 1998 (Code of practice for mastic asphalt roofing).

Mastic asphalt should always be laid over an isolating layer of Type 4A sheathing felt to BS 747: 2000 (Reinforced bitumen sheets for roofing. Specification). The exposed face of insulation upstands, at parapets and abutments, must be lined with 18 mm exterior grade plywood instead of 20 mm cork roofboard, prior to the mastic asphalt waterproofing being laid. The plywood is used as an anchor point for the expanded metal substrate onto which the vertical mastic asphalt is laid.

It is also possible to use *Kingspan Thermaroof*<sup>®</sup> TR31 with certain single-ply waterproofing membranes. Please contact the Kingspan Insulation Technical Service Department (see rear cover) for further advice.

## Water Vapour Control

Roofs, insulated only with *Kingspan Thermaroof*<sup>®</sup> TR31 over joists, and roofs with 121 / 126 mm *Kingspan Thermaroof*<sup>®</sup> TR31 over joists and < 60 mm of *Kingspan Kooltherm*<sup>®</sup> K7 Pitched Roof Board between joists, do not require a separate vapour control layer. By combining the water vapour resistance of the foil faced underside of *Kingspan Thermaroof*<sup>®</sup> TR31 with the use of a suitable water vapour resistant, non-setting, gun-grade mastic sealant, applied to the upper surface of all supporting timbers, a perfectly adequate vapour control layer can be formed. A continuous bead of vapour resistant mastic sealant should also be applied between the outside-top corner of all roof perimeter joists and noggins, and adjacent upstands and parapets.

Where 121 / 126 mm *Kingspan Thermaroof*<sup>®</sup> TR31 is installed over joists with *Kingspan Kooltherm*<sup>®</sup> K7 Pitched Roof Board  $\geq$  60 mm thick installed between joists, the application of mastic sealant to the upper surface of all supporting timbers can result in an interstitial condensation risk. In order to avoid this risk, mastic sealant should not be applied over the joists, and a separate vapour control layer should be installed under the joists instead. The separate vapour control layer should consist of either a foil backed vapour check plasterboard or a layer of polythene sheeting installed between the plasterboard and the underside of the joists. The junction between the perimeter of the vapour control layer and adjacent walls should be sealed. There is a limit to the thickness of *Kingspan Kooltherm*<sup>®</sup> K7 Pitched Roof Board that can be installed, for any particular thickness of *Kingspan Thermaroof*<sup>®</sup> TR31, in that, in order to avoid a condensation risk, the thermal resistance of the insulation component of *Kingspan Thermaroof*<sup>®</sup> TR31 must always be greater than that of the *Kingspan Kooltherm*<sup>®</sup> K7 Pitched Roof Board.

NB These recommendations are based on condensation risk calculations that assume internal conditions consistent with dwellings with low occupancy. If this occupancy assumption is incorrect, if you intend to use between joist insulation with any thickness of *Kingspan Thermaroof*<sup>®</sup> TR31 other than 121 or 126 mm, 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).

# Sitework

## Roof Loading / Traffic

*Kingspan Thermaroof*® TR31 is suitable for use on access roof decks subject to limited foot traffic.

Supporting joists should be placed at maximum 600 mm centres and noggins should be provided to coincide with the board edges.

Where inappropriate foot traffic is liable to occur, it is recommended that the supporting roof joists are spaced at maximum 400 mm centres. Noggins should be provided, as described above, and the roof surface should be protected by promenade tiles. For further advice on the acceptability of specific foot traffic regimes, please contact the Kingspan Insulation Technical Service Department (see rear cover).

## Ceiling Details

The underside of *Kingspan Thermaroof*® TR31 is not suitable to form a decorative internal finish to the roof. Therefore, it is recommended that *Kingspan Thermaroof*® TR31 should always be underdrawn by a separate ceiling such as plasterboard or similar fire resistant material. Where the roof joists are to be left exposed, the plasterboard should be fixed between joists to minimum 25 x 25 mm timber battens. The 25 mm cavity between the underside of the sheets of *Kingspan Thermaroof*® TR31 and the plasterboard ceiling can be used to run services.

## Lightning Protection

Building designers should give consideration to the requirements of BS / I.S. EN 62305: 2006 (Protection against lightning).

## Over Joist Insulation Only

- A continuous bead of vapour resistant mastic sealant should be applied between the outside-top corner of all roof perimeter joists and noggins, and adjacent upstands and parapets.
- *Kingspan Thermaroof*® TR31 should be fixed, plywood uppermost, directly onto minimum 50 mm wide joists set at maximum 600 mm centres (for maintenance access purposes) or maximum 400 mm centres (where continuous or excessive foot traffic is expected).
- In order to form a continuous vapour control layer from the foil underside of the sheets of *Kingspan Thermaroof*® TR31, a bead of water vapour resistant, non-setting, gun-grade mastic sealant, wide enough to accommodate two sheet edges butted side by side, should be applied to the upper surface of all supporting joists and noggins (see Figure 2).

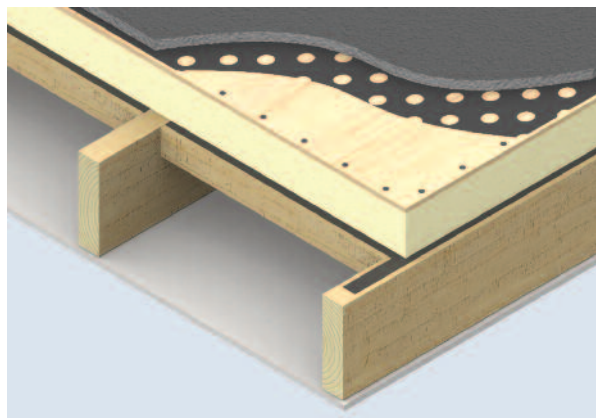


Figure 2 – Sheets laid into non setting mastic

- Sheets should be laid with the long edge along the joists and shorter edge joints should be staggered and butted (approximately 2 mm gap) ensuring there is a minimum bearing of 20 mm per sheet edge over the supporting timber (see Figure 3).

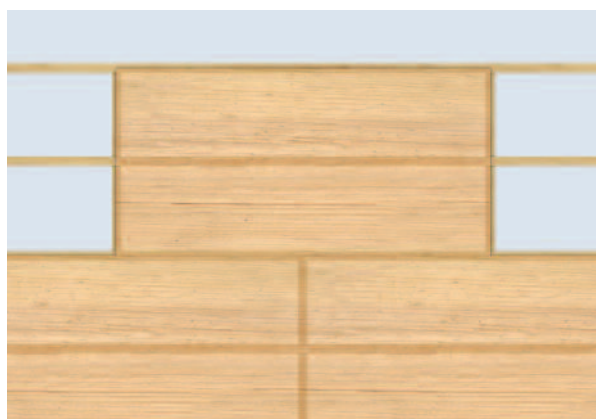


Figure 3 – Staggered joints over roof joists

- Timber noggins (minimum 50 x 50 mm) should be used to fully support any free edges of *Kingspan Thermaroof*® TR31 e.g. short edges, trimmers to openings etc.
- The number of mechanical fixings required to fix sheets of *Kingspan Thermaroof*® TR31 will vary with the geographical location of the building, the local topography, and the height and width of the roof concerned.
- As a minimum, sheets should be fixed with suitable low profile oval head screw fixings placed at 200 mm centres around the board edges and at 300 mm centres along any intermediate supporting timbers.
- The requirement for additional fixings should be assessed in accordance with BS 6399-2: 1997 (Loadings for buildings. Code of practice for wind loads) or BS / I.S. EN 1991-1.4: 2005 (National Annex to Eurocode 1. Actions on structures, General Actions, Wind Actions).
- Fixings should be no less than 10 mm from sheet edges and no less than 50 mm from sheet corners.
- Where two sheets are secured to the same joist, nail / screws should be staggered.
- Fixings should penetrate supporting timbers by a depth of minimum 35 mm.
- When securing sheets, whether nailing or screwing, care must be taken not to over-drive / screw.
- Nails / screw heads should finish flush with the plywood surface.

For more information on board fixings refer to:

Ancon Building Products +44 (0) 114 275 5224  
[www.ancon.co.uk](http://www.ancon.co.uk)

Ejot UK Limited +44 (0) 1977 687 040  
[www.ejot.co.uk](http://www.ejot.co.uk)

SFS Intec Limited +44 (0)113 2085 500  
[www.sfsintec.biz/uk](http://www.sfsintec.biz/uk)

MAK Fasteners +353 (0) 1 451 9900  
[www.makfasteners.com](http://www.makfasteners.com)

Tech Fasteners +353 (0) 1 457 3300  
[www.techfasteners.ie](http://www.techfasteners.ie)

- Roof-light or ventilator kerbs etc. should always insulated with the same thickness of *Kingspan Thermaroof*® TR31 as the general roof area.
- A 25 mm thick *Kingspan Thermaroof*® TR27 LPC/FM upstand should be used around the perimeter of the roof on the internal façade of parapets.
- A minimum distance of 300 mm should be maintained between the top of the insulation upstand and the bottom of the horizontal roof insulation.

- The waterproofing membrane is installed in accordance with the membrane manufacturer's instructions, over the whole insulated area including any insulation upstands, as soon as possible after laying the insulation sheets.

## Between and Over Joist Insulation

- For constructions where the *Kingspan Thermaroof*® TR31 is 121 / 126 mm and the *Kingspan Kooltherm*® K7 Pitched Roof Board installed between joists is < 60 mm, the installation of *Kingspan Thermaroof*® TR31 is carried out as outlined in 'Over Joist Insulation Only'.
- For constructions where the *Kingspan Thermaroof*® TR31 is 121 / 126 mm and the *Kingspan Kooltherm*® K7 Pitched Roof Board installed between joists is ≥ 60 mm thick, mastic sealant should not be applied over the joists and a separate vapour control layer should be installed under the joists instead.
- The separate vapour control layer should consist of either a foil backed vapour check plasterboard, or a layer of polythene sheeting installed between the plasterboard and the underside of the joists. The junction between the perimeter of the vapour control layer and adjacent walls should be sealed.
- In all other respects installation of *Kingspan Thermaroof*® TR31 is carried out as outlined in 'Over Joist Insulation Only'.
- Regardless of thickness, the installation of *Kingspan Kooltherm*® K7 Pitched Roof Board proceeds as follows.
- *Kingspan Kooltherm*® K7 Pitched Roof Board is fixed between joists below the *Kingspan Thermaroof*® TR31.
- Measure the distance between the joists before cutting the insulation boards as spacings can vary.
- Push the cut insulation boards between the joists so they are flush with the underside of the *Kingspan Thermaroof*® TR31.
- In order to hold the boards in place, side-nail supporting timber battens to the joists or partially drive galvanised nails into the side of the joists leaving the nail 40 mm proud.
- In all cases ensure that insulation boards between joists are fitted tightly.
- Fill any gaps between the boards and the joists with expanding urethane sealant.
- Insulate any narrow gaps between a joist and the perimeter wall with specially cut pieces of board.
- Support these on blocks nailed to the underside of the joists.

NB If you intend to use between joist insulation with any thickness of *Kingspan Thermaroof*® TR31 other than 121 or 126 mm, please consult the *Kingspan Insulation Technical Service Department* for assistance (see rear cover).

## General

### Following Trades

- The roof must be adequately protected when building works are being carried out on or over the roof surface. This is best achieved by close boarding. The completed roof must not be used for storage of heavy building components such as bricks or air conditioning equipment.

### Reflective Coatings

- Bitumen based built-up waterproofing systems laid over *Kingspan Thermo*roof® TR31 should always incorporate a solar reflective layer such as chippings or a specialist coating.

### Daily Working Practice

- *Kingspan Thermo*roof® TR31 should not be considered as temporary waterproofing. Sheets should be waterproofed as soon as possible after fixing. At the completion of each day's work, or whenever work is interrupted for extended periods of time, a temporary weather protection must be made in order to prevent water penetration into the roof construction.
- Care should be taken to ensure that the sheets are kept dry by laying only as much of the product as can be reasonably waterproofed in the working day.

### Cutting

- Cutting should be carried out by using a fine toothed saw. Do not attempt to snap the product sheets.
- Ensure accurate trimming to achieve close butting joints and continuity of insulation.

### Availability

- *Kingspan Thermo*roof® TR31 is available through specialist insulation distributors and selected roofing 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, the product should be stored inside a building. If, however, outside storage cannot be avoided, then the product should be stacked clear of the ground and covered with an opaque polythene sheet or weatherproof tarpaulin. Product that has 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](http://www.kingspaninsulation.co.uk/safety) or [www.kingspaninsulation.ie/safety](http://www.kingspaninsulation.ie/safety).

*Please note that the reflective surface on this product is designed to enhance its thermal performance. As such, it 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 facing 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 Upper Facing

The upper facing of *Kingspan Thermaroof*<sup>®</sup> TR31 is an FSC certified, 6 mm nominal thickness, WBP exterior grade plywood, secondary bonded to the insulation core.

## The Core

The core of *Kingspan Thermaroof*<sup>®</sup> TR31 is manufactured with **Nilflam**<sup>®</sup>



technology, a high performance rigid thermoset polyisocyanurate (PIR) insulant manufactured with a blowing agent that has zero Ozone Depletion Potential (ODP) and low Global Warming Potential (GWP).



## The Lower Facing

The lower facing of *Kingspan Thermaroof*<sup>®</sup> TR31 is 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.

## Standards and Approvals

*Kingspan Thermaroof*<sup>®</sup> TR31 is manufactured to the highest standards in accordance with the requirements of both BS 4841-3 (Rigid polyisocyanurate (PIR) and polyurethane (PUR) products for building end-use applications. Specification for laminated boards (roofboards) with auto-adhesively or separately bonded facings for use as roofboard thermal insulation under built-up bituminous roofing membranes) and BS 4841-4 (Rigid polyisocyanurate (PIR) and polyurethane (PUR) products for building end-use applications. Specification for laminated boards (roofboards) with auto-adhesively or separately bonded facings for use as roofboard thermal insulation under single-ply roofing membranes).

*Kingspan Thermaroof*<sup>®</sup> TR31 is also manufactured to the highest standards under a management system certified to BS / I.S. EN ISO 9001: 2008 (Quality management systems. Requirements), BS / I.S. EN ISO 14001 : 2004 (Environmental Management Systems. Requirements) and BS / I.S. OHSAS 18001: 2007 (Health and Safety Management Systems. Requirements).

## Standard Dimensions

*Kingspan Thermaroof*<sup>®</sup> TR31 is available in the following standard size:

Nominal Dimension		Availability
Length	(m)	2.4
Width	(m)	1.2
Nominal Plywood Thickness	(mm)	6
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 Thermaroof*<sup>®</sup> TR31 typically exceeds 150 kPa at 10% compression, when tested to BS / I.S. EN 826: 1996 (Thermal insulating products for building applications. Determination of compression behaviour).

## Water Vapour Resistance / Resistivity

Adjusted for the effect of unsealed board joints, the non-plywood component of, the product achieves a resistance far greater than 100 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). When the joints between boards are sealed by the application of a continuous mastic sealant to the whole of the upper surface of the joists and cross noggins, a vapour resistance greater than 1000 MN-s/g can be achieved by the non-plywood component of the product. For the purposes of calculation of condensation risk, the resistivity of the plywood component of the product should be taken as 520 MN-s/g.m.

## Durability

If correctly installed, *Kingspan Thermaroof*<sup>®</sup> TR31 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 sheets 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 sheets or sheets 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 Thermaroof*® TR31 resist attack by mould and microbial growth, and do not provide any food value to vermin.

## Fire Performance

*Kingspan Thermaroof*® TR31, when subjected to the British Standard fire test specified in the table below, will achieve the result shown, when waterproofed with 3 layer built-up felt and a loading coat of 10 mm chippings. For specifications without the chippings please consult the manufacturer of the mineral surfaced cap sheet for their fire classification details.

Test	Result
BS 476-3: 2004 (External fire exposure roof test)	FAA rating

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

## Thermal Properties

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

### Thermal Conductivity

Thermal conductivity ( $\lambda$ -value) of the plywood component of *Kingspan Thermaroof*® TR31 should be taken as 0.14 W/m·K.

The thermal conductivity ( $\lambda$ -value) of the insulation core of *Kingspan Thermaroof*® TR31 is 0.022 W/m·K.

### Thermal Resistance

Thermal resistance (R-value) varies with the thickness of each component. It is calculated by dividing the thickness of each component (expressed in metres) by its thermal conductivity, followed by adding the resulting figures together. The sum is rounded down to the nearest 0.05 (m<sup>2</sup>·K/W).

Product Thickness* (mm)	Thermal Resistance (m <sup>2</sup> ·K/W)
91	3.90
96	4.10
101	4.35
106	4.55
111	4.80
116	5.00
121	5.25
126	5.45

\* Product thickness = insulant thickness + 6 mm plywood.

NB Refer to local distributor or Kingspan Insulation price list for current stock and non-stock sizes. For thickness above 126 mm an additional layer of insulation between joists is required.

# 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
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## 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.

Available as a complete Design Manual or as individual product brochures, Kingspan Insulation technical literature is an essential specification tool. 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
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	- 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
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	- email:	tapered@kingspaninsulation.ie

## Technical Advice / Design

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
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## General Enquiries

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

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Ireland	- Tel:	+353 (0) 42 979 5000
	- Fax:	+353 (0) 42 975 4299
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