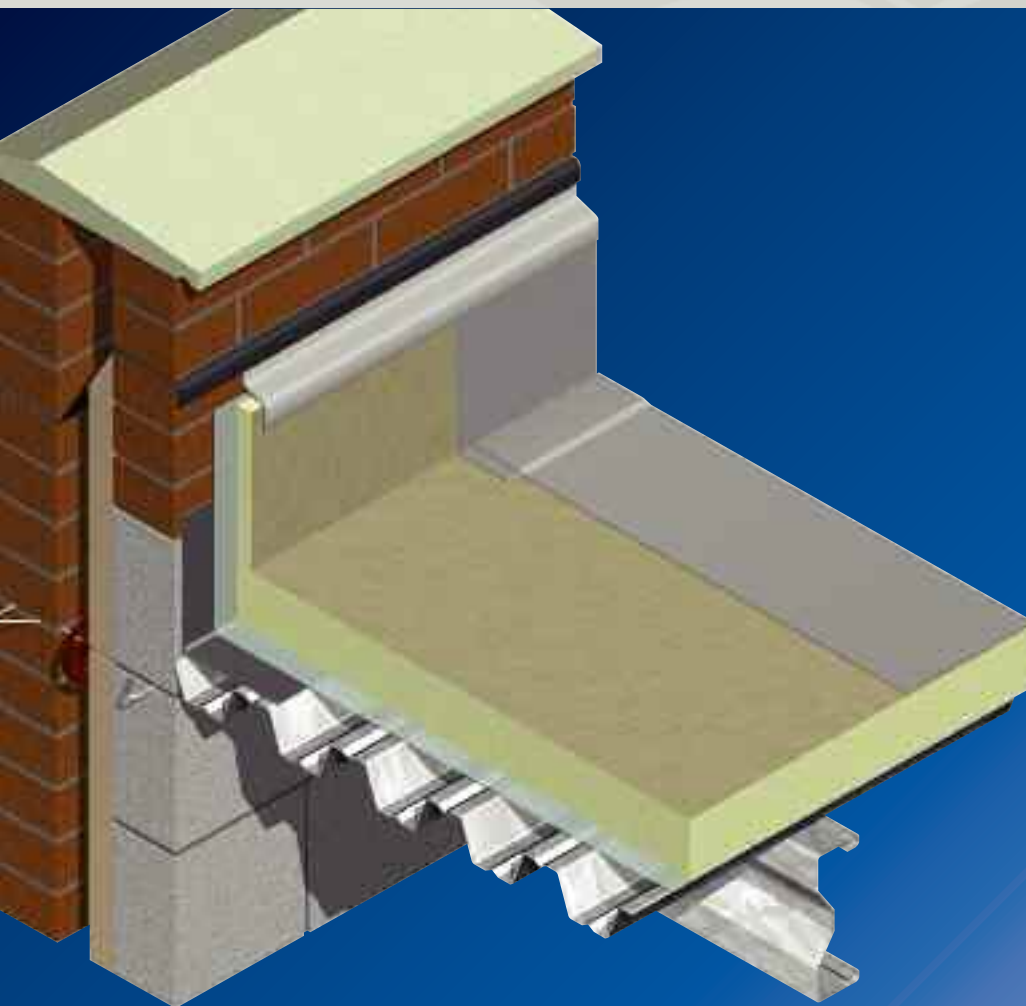


ThermaTMroof TR27 LPC/FM

INSULATION BENEATH MECHANICALLY FIXED / FULLY ADHERED SINGLE-PLY WATERPROOFING, AND PARTIALLY BONDED BUILT-UP FELT AND MASTIC ASPHALT



- High performance rigid urethane insulation – thermal conductivity 0.025–0.027 W/m-K
- LPCB approved to LPS 1181: Part 1 for built-up cladding systems for use as the external envelope of buildings* see page 3
- Proven Factory Mutual Research Corporation fire performance for Class 1 steel deck roof assemblies
- Fully compatible with all mechanically fixed PVC and EPDM single-ply waterproofing systems
- Fully compatible with single-ply non-bituminous membranes that are fully bonded with solvent based adhesive systems.
- Fully Compatible with most bitumen based and mastic asphalt waterproofing systems
- Resistant to the passage of water vapour
- Easy to handle and install
- Ideal for new build and refurbishment
- Non-deleterious material
- CFC/HCFC-free with zero Ozone Depletion Potential (ODP)



LPS 1181: Part 1
Certificate No. 388b/02



APPROVED
Class 1 Roof
Construction



Low Energy -
Low Carbon Buildings

Typical Design Details

Single Ply Waterproofing Membrane

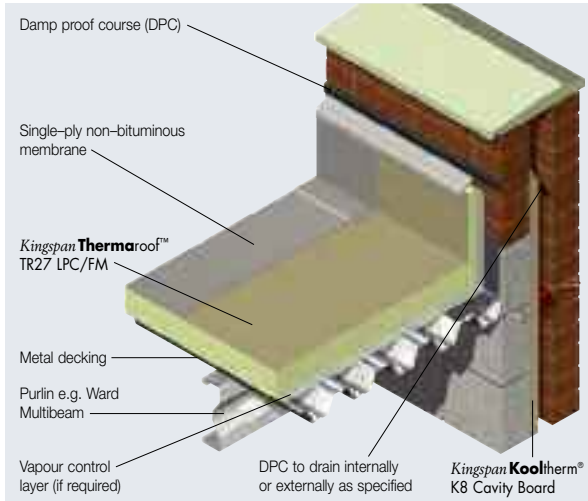


Figure 1a Insulation Installed Above a Metal Deck – Single-ply Membrane

Partially Bonded Built-Up Felt Waterproofing

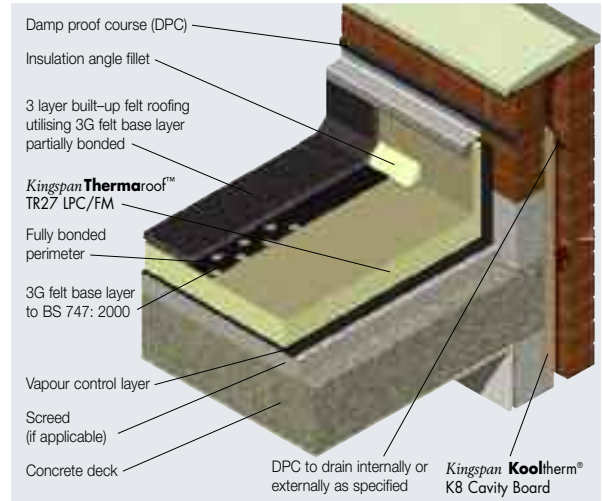


Figure 2a Dense Concrete Deck With Suspended Ceiling – Partially Bonded Built-Up Felt Waterproofing

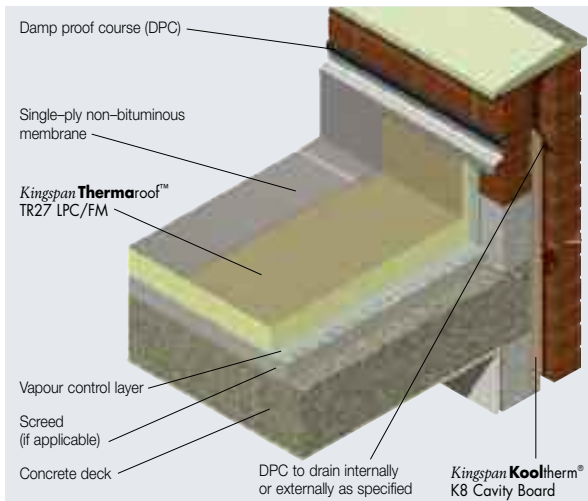


Figure 1b Insulation Installed Above a Concrete Deck – Single-ply Membrane

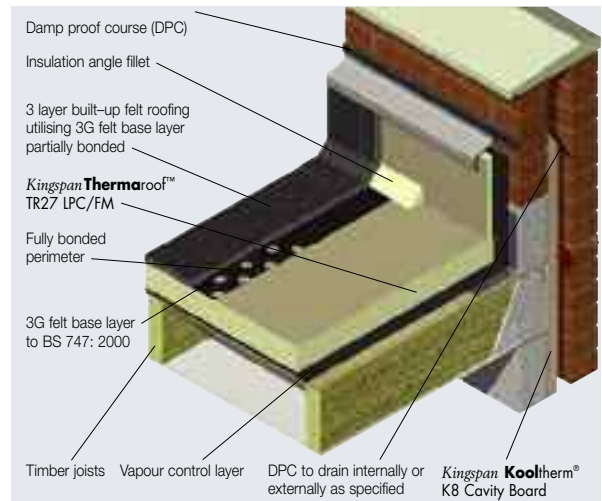


Figure 2b Timber Deck With Suspended Ceiling – Partially Bonded Built-Up Felt Waterproofing

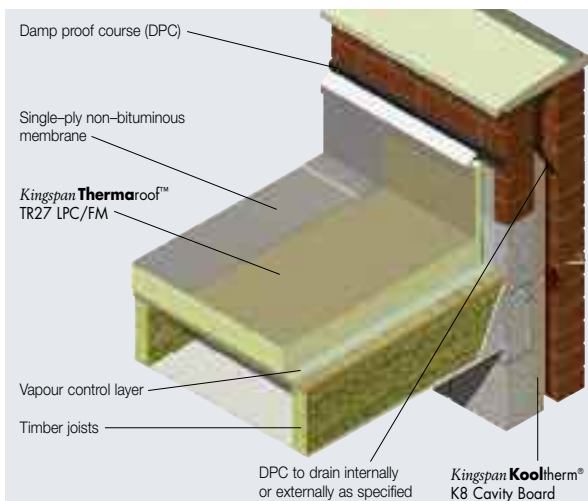


Figure 1c Insulation Installed Above a Timber Deck – Single-ply Membrane

Mastic Asphalt Waterproofing

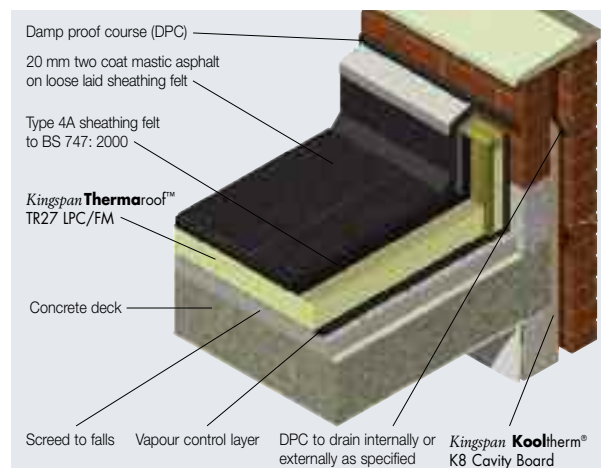


Figure 3a Dense Concrete Deck With Suspended Ceiling – Mastic Asphalt Waterproofing

Specification Clause

Kingspan Thermaroof™ TR27 LPC/FM should be described in specifications as:-

The roof insulation shall be *Kingspan Thermaroof™* TR27 LPC/FM ____mm thick, comprising a CFC/HCFC-free rigid thermoset polyisocyanurate (PIR) insulation core with autohesively bonded coated glass tissue facings on both sides manufactured to the highest standards in accordance with the requirements of BS 4841-4 and BS 4841-3 and quality control systems approved to BS EN ISO 9001: 2000 / I.S. EN ISO 9001: 2000 by Kingspan Insulation Limited and shall be applied in accordance with the instructions issued by them.

Details also available in NBS Plus.

NBS users should refer to clause(s):

J21 420, J21 430 (Standard and Intermediate)

J21 10 (Minor Works)



*Compliance

FM Compliance

Where a full FM compliant Class 1 roof construction is required it is important that all roof components also have FM approval.

Please contact the Kingspan Insulation Technical Service Department (see rear cover) for further advice on the above.

LPCB Compliance

Where a full LPCB approved roof assembly is desired, the construction, as detailed within LPS 1181: Part 1 Certificate No. 388b/02, must be adopted. This includes:

0.7mm gauge, 35mm deep sealed profiled metal deck;
30-120mm in a single layer of CFC/HCFC-free zero ODP rigid urethane insulation; and a mechanically fixed roof membrane.

The system was tested in combination with LPCB approved PIR wall panels. The approval certificate covers the roof assembly not only with PIR wall panels, but also with masonry wall constructions.

It should be noted that this literature contains both compliant and non-compliant constructions. Please contact Kingspan Insulation Technical Service Department (see rear cover) for further advice on the above.

Design Considerations

Sustainability

In the past, erroneously, the relative environmental sustainability of insulation materials has been compared on the basis of embodied energy and ozone depletion potential. It is now recognised that a much wider basket of embodied environmental impacts (including those caused by their embodied energy), rather than embodied energy alone, is the only credible tool of comparison. Time has also annulled ozone depletion potential as an issue as all insulation materials are now banned from using CFC and HCFC blowing agents by law.

For buildings designed to today's Building Regulations energy use standards it is now also known that the embodied environmental impacts of all of the materials and labour used to create a building are insignificant in comparison with the lifetime operational environmental impacts of that building, and so are of very limited importance. Since it is operational energy use that creates the vast majority of operational environmental impact, saving energy by specifying the lowest U-values possible is the most environmentally sustainable action to take.

However, one of the most neglected facts about environmentally sustainable buildings is that the longevity of their standards of operational energy use, and therefore the longevity of their operational environmental impacts, is critical. The performance of some insulants, such as mineral fibre, can deteriorate rapidly if exposed to water penetration, air movement or compression. This may increase operational energy use and hence compromise the environmental sustainability of the finished building to an alarming degree. Other insulation materials, such as rigid phenolic or rigid urethane, are not vulnerable to any of these problems.

In summary, designers should:

- (a) specify the lowest possible U-value regardless of insulation type;
- (b) design out the risk of their chosen insulant not performing as specified; and
- (c) if the latter is not possible, choose an insulant that is at low risk of failure e.g. a cellular plastic insulation material.

Therma^{roof}TM TR27 LPC/FM

However, manufacturers should not rest on their laurels; it is a matter of social responsibility to be open and honest about the environmental impact of the manufacture of a product, and a full Life Cycle Analysis (LCA) based on a much wider basket of environmental impacts, rather than embodied energy alone, is recognised as the preferred tool to achieve this. Kingspan Insulation was the first insulation manufacturer to openly complete and publish independently certified Ecoprofiles (a type of LCA) on its product ranges. The Ecoprofile for the **Kingspan ThermaTM** range of rigid urethane insulation products was performed by Building Research Establishment (BRE). The product range comfortably achieves a BRE Green Guide A rating.



But there is far more to sustainability than whether or not a product, process or company affects the environment in a positive or a negative way. A company can, and should, demonstrate its financial viability and social responsibility, as well as ensure that its materials and methods do not add unduly to the burden placed on the planet.

Kingspan Insulation has now put the manufacture of its products at its Pembridge facility in Herefordshire through a rigorous independent appraisal of its economic, social, environmental and natural resource impacts using Arup's SPeAR[®] tool.

The results show a well balanced performance in terms of sustainability, and that Kingspan Insulation is already meeting legislation or best practice in most areas, even moving beyond best practice in some. Kingspan Insulation is the first and only construction material manufacturer to have taken this bold move and openly publish the results.

Fire Performance

Designers, specifiers and end users are offered peace of mind by the fact **Kingspan Therma^{roof}TM TR27 LPC/FM** insulation boards are now available with the dual approval of the widely respected Loss Prevention Certification Board and the Factory Mutual Research Corporation, USA, for achieving market leading levels of fire performance.

The **Kingspan Therma^{roof}TM TR27 LPC/FM** carries independent approval under LPS 1181: Part 1 by the Loss Prevention Certification Board (Note that this testing was conducted on a sealed metal deck without separate vapour control layer) and is certified as meeting the Factory Mutual Research Standard 4450 (1989) and 4470 (1986) Approval requirements for Class 1 Insulated Steel Deck Roofs. Kingspan Insulation is the first manufacturer to achieve both of these prestigious approvals with zero ODP high efficiency insulation boards.

Wind Loadings

Wind loadings should be assessed in accordance with BS 6399-2: 1997 (Loading for buildings. Code of practice for wind loads).

Roof Waterproofing

Kingspan Therma^{roof}TM TR27 LPC/FM is suitable for use with most fully adhered and mechanically fixed PVC or EPDM single-ply waterproofing membranes. Please contact the Kingspan Insulation Technical Service Department (see rear cover) to check waterproofing membrane and proprietary adhesive system for compatibility. Advice should be sought from the appropriate waterproofing manufacturer in relation to the requirement to use a fleece backed membrane.

Kingspan Therma^{roof}TM TR27 LPC/FM is also 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 is laid dry and loose, mineral face down with a fully bonded perimeter zone. The roof waterproofing should be applied as soon as possible after the laying of the boards. The built-up roof specification should be laid where applicable in accordance with BS 8217: 2005 (Reinforced bitumen membranes for roofing. Code of practice). It is also suited to mastic asphalt waterproofing systems. The mastic asphalt roof specification 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. The roof waterproofing should be applied as soon as possible after laying the boards.

Please Note: **Kingspan Therma^{roof}TM TR27 LPC/FM** is not suitable for use on insulated balconies waterproofed with mastic asphalt with a porous promenade tile overlay.

Falls

The fall on a flat roof should be smooth and steep enough to prevent the formation of rainwater ponds. 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. The fall on a flat roof constructed using **Kingspan Therma^{roof}TM TR27 LPC/FM** is normally provided by the supporting structure being directed towards the rainwater outlets. However, because of building settlement, it is advisable to design in even greater falls. These can be provided by the use of a Kingspan Insulation Tapered Roofing System (see right).

Tapered Roofing

*Kingspan Therma*roof™ TR27 LPC/FM is also available in a tapered version (*Kingspan Therma*taper® TT47 LPC/FM), comprising of a high performance CFC/HCFC-free rigid urethane core autohesively bonded to coated glass tissue facings during manufacture. Further details of the *Kingspan Therma*taper® system and a complete design service are available from the Kingspan Insulation Tapered Roofing Department (see rear cover) who should be consulted as early as possible in the process of roof design in order that they may offer the benefit of their considerable experience to the design team.

Water Vapour Control

*Kingspan Therma*roof™ TR27 LPC/FM should either be installed over a separate vapour control layer or onto a sealed metal deck (Contact Kingspan Insulation Technical Advice for condensation risk analysis). The type of vapour control layer required will be dependent upon the chosen method of fixing the board. For mechanically fixed applications a minimum vapour control layer should consist in a 1000 gauge (250 micron) polythene sheet, with all joints lapped and then sealed with double sided self adhesive tape. For applications where the board is to be bonded bituminously, a minimum vapour control layer should consist in a coated roofing felt (e.g. Type 3B) conforming to BS: 8747 2007 (Reinforced bitumen sheets for roofing. Specification). For applications where the boards are to be bonded using a proprietary adhesive system the advice of the adhesive manufacturer should be sought.

Roof Loading

Depending on the chosen waterproofing system, *Kingspan Therma*roof™ TR27 LPC/FM is suitable for use on access roof decks subject to limited foot traffic. Where continuous or excessive foot traffic is liable to occur it is recommended that the roof surface is protected by specially constructed walk-ways. 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.

Spanning on Metal Decks

The designer's attention is drawn to the requirement that insulation boards comply with the minimum thicknesses shown in the table below, when used over metal decks with trough openings as shown.

Trough Opening (mm)	Minimum Insulant Thickness (mm)
≤ 75	25
76–100	30
101–125	35
126–150	40
151–175	45
176–200	50

Typical U-values

The following examples have been calculated using the Combined Method for compliance with Building Regulations / Standards revised after 2002. These examples are based on *Kingspan Therma*roof™ TR27 LPC/FM unless otherwise stated, waterproofed using a fully adhered single-ply membrane. The board is bedded in bitumen on top of the vapour control layer which is fully bonded to the type of deck stated for each application. The ceiling, where applicable, is taken to be a 3 mm skim coated 12.5 mm plasterboard with a cavity between it and the underside of the deck. If your construction is any different, please consult the Kingspan Insulation Technical Service Department (see rear cover).

Combined Method – U-values were calculated using the method which has been adopted to bring National standards in line with the European Standard calculation method, BS / I.S. EN ISO 6946: 1997 (Building components and building elements. Thermal resistance and thermal transmittance. Calculation method).

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. Please call the Kingspan Insulation Technical Service Department (see rear cover) for assistance.

Therma^{roof}™ TR27 LPC/FM

Single Ply Waterproofing Membrane

Insulant Thickness (mm)	U-value (W/m ² ·K)
75	0.34
80	0.31
90	0.28
100	0.25
110	0.23
120	0.20
130	0.19
140	0.17
80+80	0.16
80+85	0.15
80+95	0.14
100+95	0.13

NB There is a limit to the maximum thickness of Kingspan **Therma^{roof}™ TR27 LPC/FM** that is available. Not all thicknesses are available. Refer to local distributor or Kingspan Insulation for latest stock and thicknesses available. In order to achieve low U-values two layers of insulation may be required. Where two layers are shown, the first thickness refers to the thickness laid directly onto the deck / vapour control layer, the second thickness to the overlay.

NB The type of mechanical fixing used may change the thickness of insulation required. These calculations assume telescopic tube fasteners with a thermal conductivity of 1.00 W/m·K or less, the effect of which is insignificant.

Figure 1a Insulation Installed Above a Metal Deck – Single-ply Membrane with no ceiling

Insulant Thickness (mm)	U-value (W/m ² ·K)
65	0.34
70	0.32
75	0.30
80	0.28
90	0.25
100	0.23
105	0.22
110	0.21
120	0.19
130	0.17
140	0.16
80+80	0.15
80+90	0.14
80+100	0.13

NB There is a limit to the maximum thickness of Kingspan **Therma^{roof}™ TR27 LPC/FM** that is available. Not all thicknesses are available. Refer to local distributor or Kingspan Insulation for latest stock and thicknesses available. In order to achieve low U-values two layers of insulation may be required. Where two layers are shown, the first thickness refers to the thickness laid directly onto the deck / vapour control layer, the second thickness to the overlay.

Figure 1b Insulation Installed Above a Concrete Deck – Single-ply Membrane with suspended ceiling

Insulant Thickness (mm)	U-value (W/m ² ·K)
65	0.33
70	0.32
75	0.30
80	0.27
90	0.25
105	0.22
110	0.21
120	0.19
130	0.17
140	0.16
80+80	0.15
80+90	0.14
80+100	0.13

NB There is a limit to the maximum thickness of Kingspan **Therma^{roof}™ TR27 LPC/FM** that is available. Not all thicknesses are available. Refer to local distributor or Kingspan Insulation for latest stock and thicknesses available. In order to achieve low U-values two layers of insulation may be required. Where two layers are shown, the first thickness refers to the thickness laid directly onto the deck / vapour control layer, the second thickness to the overlay.

Figure 1c Insulation Installed Above a Timber Deck – Single-ply Membrane with suspended ceiling

Partially Bonded Built-Up Felt Waterproofing

Insulant Thickness (mm)	U-value (W/m ² ·K)
65	0.34
70	0.31
75	0.30
80	0.27
90	0.25
100	0.23
105	0.22
110	0.21
120	0.18
130	0.17
140	0.16
80+80	0.15
80+90	0.14
80+100	0.13

NB There is a limit to the maximum thickness of Kingspan **Therma^{roof}™ TR27 LPC/FM** that is available. Not all thicknesses are available. Refer to local distributor or Kingspan Insulation for latest stock and thicknesses available. In order to achieve low U-values two layers of insulation may be required. Where two layers are shown, the first thickness refers to the thickness laid directly onto the deck / vapour control layer, the second thickness to the overlay.

Figure 2a Dense Concrete Deck With Suspended Ceiling – Partially Bonded Built-Up Felt Waterproofing

Insulant Thickness (mm)	U-value (W/m ² ·K)
65	0.33
70	0.31
75	0.29
80	0.27
90	0.24
105	0.21
120	0.18
130	0.17
140	0.16
80+80	0.15
80+90	0.14
80+100	0.13

NB There is a limit to the maximum thickness of Kingspan **Therma^{roof}™ TR27 LPC/FM** that is available. Not all thicknesses are available. Refer to local distributor or Kingspan Insulation for latest stock and thicknesses available. In order to achieve low U-values two layers of insulation may be required. Where two layers are shown, the first thickness refers to the thickness laid directly onto the deck / vapour control layer, the second thickness to the overlay.

Figure 2b Timber Deck With Suspended Ceiling – Partially Bonded Built-Up Felt Waterproofing

Mastic Asphalt Waterproofing

Insulant Thickness (mm)	U-value (W/m ² ·K)
65	0.34
70	0.31
75	0.30
80	0.27
90	0.25
100	0.23
105	0.22
110	0.21
120	0.18
130	0.17
140	0.16
80+80	0.15
80+90	0.14
80+100	0.13

NB There is a limit to the maximum thickness of Kingspan **Therma^{roof}™ TR27 LPC/FM** that is available. Not all thicknesses are available. Refer to local distributor or Kingspan Insulation for latest stock and thicknesses available. In order to achieve low U-values two layers of insulation may be required. Where two layers are shown, the first thickness refers to the thickness laid directly onto the deck / vapour control layer, the second thickness to the overlay.

Figure 3a Dense Concrete Deck With Suspended Ceiling – Mastic Asphalt Waterproofing

Sitework

Vapour Control Layer

If a sealed metal deck option is not possible, it will be necessary to use a vapour control layer.

Metal decks and concrete decks should be primed in accordance with the appropriate manufacturers instructions prior to the application of the hot bitumen or suitable alternative proprietary adhesive system used to bond the vapour control layer to the deck. The specified vapour control layer should be continued 250 mm past the insulation abutting the parapet and sealed.

Fixing over Metal Decks

On metal decks if the deck is not sealed, *Kingspan Thermaroof™* TR27 LPC/FM should be laid over the vapour control layer. The boards are commonly secured using mechanical fixings and washers (see 'Mechanical Fixing'). The boards should be laid break-bonded, either with the long edges at right angles to the trough openings or diagonally across the corrugation line. Whichever system is chosen, care must be taken to ensure that all joints are supported by the deck. The joints should be lightly butted.

Alternatively the boards can be either laid into hot bitumen (max. temperature 240°C) mopped or poured over the vapour control layer or with the use of suitable alternative proprietary adhesive systems. However, advice should be sought from the appropriate manufacturer of the adhesive system for their recommendations on the correct procedure for application rates and application temperatures.

Fixing over Concrete Decks

Concrete decks should be clean, dry, without large projections, steps or gaps, and should be graded to allow correct falls to all rainwater outlets. To ensure an adequate bond between the vapour control layer and the concrete deck, the concrete or screeded surface should be suitably primed, in accordance with the specified manufacturer's instructions. The vapour control layer should be fully bonded to the deck and similarly the *Kingspan Thermaroof™* TR27 LPC/FM to the vapour control layer by laying into hot bitumen mopped or poured over the vapour control layer or with the use of suitable alternative proprietary adhesive systems. However, advice should be sought from the appropriate manufacturer of the adhesive system for their recommendations on the correct procedure for application rates and application temperatures. The boards should be laid break-bonded with all joints lightly butted.

Alternatively the boards can be secured using mechanical fixing systems (see 'Mechanical Fixing').

Fixing over Plywood Decks

Kingspan Thermaroof™ TR27 LPC/FM should be fully bedded in hot bitumen or with the use of suitable alternative proprietary adhesive systems. However, advice should be sought from the appropriate manufacturer of the adhesive system for their recommendations on the correct procedure for application rates and application temperatures over a continuous vapour control layer, which has been nailed or fully bonded to the deck, with laps at the side and end sealed with either the use of hot bitumen or one of the alternative proprietary adhesive systems as detailed previously. The boards should be laid break-bonded, either with the long edges at right angles to the edge or diagonally across the roof. Joints should be lightly butted.

Alternatively the boards can be secured using mechanical fixing systems (see 'Mechanical Fixing').

Fixing over Tongue and Groove Decks

On timber tongue and groove decks, the vapour control layer should be nailed. The *Kingspan Thermaroof™* TR27 LPC/FM is then applied as described within 'Fixing over Plywood Decks'. During the laying of *Kingspan Thermaroof™* TR27 LPC/FM the nail heads will become sealed with either the use of hot bitumen or one of the alternative proprietary adhesive systems as detailed previously for plywood decks to the vapour control layer by the subsequent bonding of the roofboard.

Fixing over Woodwool Decks

Woodwool decks should be clean and free of large projections, steps or gaps and should be graded to allow correct falls to all rainwater outlets. *Kingspan Thermaroof™* TR27 LPC/FM should be fully bedded in hot bitumen or with the use of suitable alternative proprietary adhesive systems. However, advice should be sought from the appropriate manufacturer of the adhesive system for their recommendations on the correct procedure for application rates and application temperatures over a continuous vapour control layer. The boards should be laid break-bonded, either with the long edges at right angles to the edge or diagonally across the roof. Joints should be lightly butted. Board joints should not coincide with those of the slabs.

Alternatively boards can be secured using specialist mechanical fixing systems (see 'Mechanical Fixing').

Fixing Two Layer Systems

In situations where two layers of insulation are required, both layers of insulation should be installed in the same manner, which varies according to the deck type (as detailed in the preceding five sections). In all cases, the two layers should be horizontally offset relative to each other so that no two board joints in the two layers coincide with each other. For mechanically fixed specifications, the base layer should be fixed with minimum 1 No. fixings in the centre of each board before fixing the top layer as detailed in the following section.

Mechanical Fixing

The number of mechanical fixings required to fix *Kingspan Therma^{roof}™ TR27 LPC/FM* will vary with the geographical location of the building, the topographical data, and the height and width of the roof concerned.

Each fixing should incorporate a square or circular plate washer, (50 mm x 50 mm or 50 mm diameter).

The requirements for securing the waterproofing membrane should be considered separately.

2.4 x 1.2 m board

A minimum 6 No. fixings should be placed within the individual board area and be sited > 50 mm and < 150 mm from the edges and corners of the board giving a minimum fixing rate of 2.10 fixings per square metre.

1.2 x 0.6 m board

A minimum 4 No. fixings should be placed within the individual board area and be sited > 50 mm and < 150 mm from the edges and corners of the board giving a minimum fixing rate of 5.55 fixings per square metre.

The requirement for additional fixings should be assessed in accordance with BS 6399-2: 1997 (see Figure 1).

Where alternative mechanical fixing systems that do not rely on large washers are specified, such as bar fixing systems, the specified system must give similar restraint to the board as would be attained by the use of conventional washer and screw systems.

NB If consideration is being given to bonding the boards either in hot bitumen or with the use of a suitable alternative proprietary adhesive system it is recommended that only the 1.2 x 0.6 m board size is adopted.

NB In all instances board joints and cut edges should be taped with a minimum 50 mm foil tape prior to the application of the adhesive system and single layer roof waterproofing. The single layer roof waterproofing and adhesive system should be applied strictly in accordance with the appropriate manufacturers recommendations.

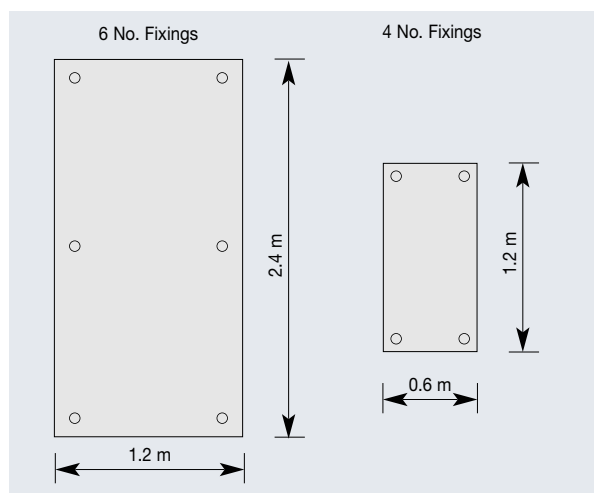


Figure 1 Typical Mechanical Fixing Patterns

Reflective coatings

Bitumen based built up waterproofing systems laid over *Kingspan Therma^{roof}™ TR27 LPC/FM* should always incorporate a solar reflective layer such as chippings or specialist coatings.

Daily Working Practice

At the completion of each day's work, or whenever work is interrupted for extended periods of time, a night joint must be made in order to prevent water penetration of the roof construction.

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.

Availability

Kingspan Therma^{roof}™ TR27 LPC/FM is available through specialist insulation distributors and selected roofing merchants throughout the UK, Ireland and Europe.

Packaging

The boards are supplied in labelled packs shrink-wrapped in polythene.

Storage

The polythene packaging of Kingspan Insulation products should not be considered adequate for long term 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 a 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 leaflet on this topic which satisfies the requirements set out in the Control of Substances Hazardous to Health Regulations 1988 (COSHH) is available from the Kingspan Insulation Marketing Department (see rear cover).


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

Product Description

The Facings

Kingspan Thermaroof™ TR27 LPC/FM is faced on both sides with a coated glass tissue autohesively bonded to the insulation core during manufacture.

The Core

The core of *Kingspan Thermaroof™* TR27 LPC/FM is manufactured from trademarked  **Nilflam®** technology (a high performance CFC/HCFC-free rigid thermoset polyisocyanurate (PIR) formulation). *Kingspan Thermaroof™* TR27 LPC/FM has a typical density of 32 kg/m³.

CFC/HCFC-free

Kingspan Thermaroof™ TR27 LPC/FM is manufactured without the use of CFCs/HCFCs and has zero Ozone Depletion Potential (ODP).



Product Data

Standards and Approvals

Kingspan Thermaroof™ TR27 LPC/FM 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) and also under quality control systems approved to BS EN ISO 9001: 2000 / I.S. EN ISO 9001: 2000 (Quality management systems. Requirements).

Its use is covered by BBA Certificate 06/4372.



Manufactured to BS EN ISO 9001: 2000
Certificate No. 388



I.S. EN ISO 9001: 2000
Registration No. 19.0633



Standard Dimensions

Kingspan Thermaroof™ TR27 LPC/FM is available in the following standard size(s):

Nominal Dimension	Availability
Length (m)	1.2 (2.4)
Width (m)	0.6 (1.2)
Insulant Thickness (mm)	Refer to local distributor or Kingspan Insulation price list for current stock and non-stock sizes.

Therma^{roof}™ TR27 LPC/FM

Compressive Strength

The compressive strength of *Kingspan Therma^{roof}™ TR27 LPC/FM* typically exceeds 150 kPa at 10% compression and 125 kPa at 5% when tested to BS EN 826: 1996 (Thermal insulating products for building applications. Determination of compression behaviour).

Water Vapour Resistance

Modified to include board facings, the boards achieve a resistance greater than 15 MN·s/g when tested in accordance with BS 4370-2: 1993 (Methods of test for rigid cellular materials. Methods 7 to 9). *Kingspan Therma^{roof}™ TR27 LPC/FM* should be installed over a vapour control layer (see 'Water Vapour Control' page 4).

Durability

If correctly applied, *Kingspan Therma^{roof}™ TR27 LPC/FM* has 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^{roof}™ TR27 LPC/FM* resist attack by mould and microbial growth, and do not provide any food value to vermin.

Fire Performance

Kingspan Therma^{roof}™ TR27 LPC/FM, when assessed to the following internationally accredited full construction test methods achieve the following results.

Test	Result
Factory Mutual Research Standard 4450 (1989) and 4470 (1986) Class 1 Insulated Steel Deck Roofs	Class 1 Insulated Steel Deck Pass
Loss Prevention Certification Board LPS 1181: Part 1: Issue 1 – Requirements and tests for built-up systems for use as the external envelope of buildings. BS 476-3: 1958 (External fire exposure roof test)	Ext-B Pass for 30 - 120 mm thick insulation tested on a sealed 35 mm deep profiled metal deck without separate vapour control layer. Dependent on single-ply membrane adopted

The following results are achieved 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: 1958 (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).

Insurance Rating

Kingspan Therma^{roof}™ TR27 LPC/FM carries independent approval under LPS 1181: Part 1 by the Loss Prevention Certification Board* (see page 3) and is certified as meeting the Factory Mutual Research Standard 4450 (1989) and 4470 (1986) subject to the conditions of approval as a roof insulation for use in Class 1 roof construction as described in the current edition of Factory Mutual Research Approval Guide.

Kingspan Insulation is the first manufacturer to achieve both these prestigious approvals with zero ODP high efficiency insulation boards.



Thermal Properties

The λ -values and R-values quoted are in accordance with the Harmonised European Standard BS EN 13165: 2001 (Thermal insulation products for buildings – Factory made rigid polyurethane foam (PUR) products – Specification) using so called 90 / 90 principles. Comparison with alternative products may not be appropriate unless the same procedures have been followed.

Thermal Conductivity

The boards achieve a thermal conductivity (λ -value) of 0.027 W/m·K (insulant thickness < 80 mm) and 0.026 W/m·K (insulant thickness 80–119 mm).

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.

Insulant Thickness (mm)	Thermal Resistance (m ² ·K/W)
60	2.20
65	2.40
70	2.55
75	2.75
80	3.05
85	3.25
90	3.45
95	3.65
100	3.80
105	4.00
110	4.20
120	4.80
130	5.20
140	5.60

Refer to local distributor or Kingspan Insulation price list for current stock and non-stock thicknesses.

For thickness above 140 mm a double layer of insulation is required.

The Kingspan Insulation Product Range

The Kingspan Kooltherm® K-range

- With a thermal conductivity of 0.021–0.024 W/m·K CFC/HCFC-free rigid phenolic insulation is the most thermally efficient insulation product commonly available.
- Utilises the thinnest possible insulation board to achieve required U-values.
- Fire performance can be equivalent to mineral fibre.
- Achieves a Class 0 fire rating to the Building Regulations and Low Risk rating for the Technical Standards in Scotland.
- Achieves the best possible rating of < 5% smoke obscuration when tested to BS 5111: Part 1: 1974.
- CFC/HCFC-free with zero Ozone Depletion Potential (ODP).

The Kingspan Therma™ Range

- With a thermal conductivity of 0.023–0.028 W/m·K CFC/HCFC-free rigid urethane insulation is one of the most thermally efficient insulation products commonly available.
- Easily achieves required U-values with minimum board thickness.
- Achieves the required fire performance for the intended application.
- CFC/HCFC-free with zero Ozone Depletion Potential (ODP).

The Kingspan Styrozone® & Purlcrete® Ranges

- Rigid extruded polystyrene insulation (XPS) has the highest compressive strength of any commonly available insulant.
- Ideal for specialist applications such as inverted roofing and heavy-duty flooring.
- Easily achieves required U-values with minimum board thickness.
- Achieves the required fire performance for the intended application.
- CFC/HCFC-free with zero Ozone Depletion Potential (ODP).

All Products

- Their closed cell structure resists both moisture and water vapour ingress – problems which can be associated with open cell materials such as mineral fibre and which can result in reduced thermal performance.
- Unaffected by air movement – problems that can be experienced with mineral fibre and which can reduce thermal performance.
- Safe and easy to install – non-fibrous.
- Provide reliable long term thermal performance over the lifetime of the building.

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) 870 850 8555
	- Fax:	+44 (0) 870 850 8666
	- email:	commercial.uk@insulation.kingspan.com
Ireland	- Tel:	+353 (0) 42 97 54200
	- Fax:	+353 (0) 42 97 54299
	- email:	commercial.ie@insulation.kingspan.com

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 on the numbers below:

UK	- Tel:	+44 (0) 870 733 8333
	- Fax:	+44 (0) 1544 387 299
	- email:	literature.uk@insulation.kingspan.com
Ireland	- Tel:	+353 (0) 42 97 54298
	- Fax:	+353 (0) 42 97 54299
	- email:	literature.ie@insulation.kingspan.com

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) 870 761 7770
	- Fax:	+44 (0) 1544 387 289
	- email:	tapered.uk@insulation.kingspan.com
Ireland	- Tel:	+353 (0) 42 97 54297
	- Fax:	+353 (0) 42 97 54296
	- email:	tapered.ie@insulation.kingspan.com

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.

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

UK	- Tel:	+44 (0) 870 850 8333
	- Fax:	+44 (0) 1544 387 278
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Ireland	- Tel:	+353 (0) 42 97 54297
	- Fax:	+353 (0) 42 97 54296
	- email:	techline.ie@insulation.kingspan.com

General Enquiries

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

UK	- Tel:	+44 (0) 870 850 8555
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	- email:	info.ie@insulation.kingspan.com

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 as to the 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 the literature is current by contacting the Kingspan Insulation Marketing Department (see left).



Kingspan Insulation is a member of the single-ply roofing association (SPRA)



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