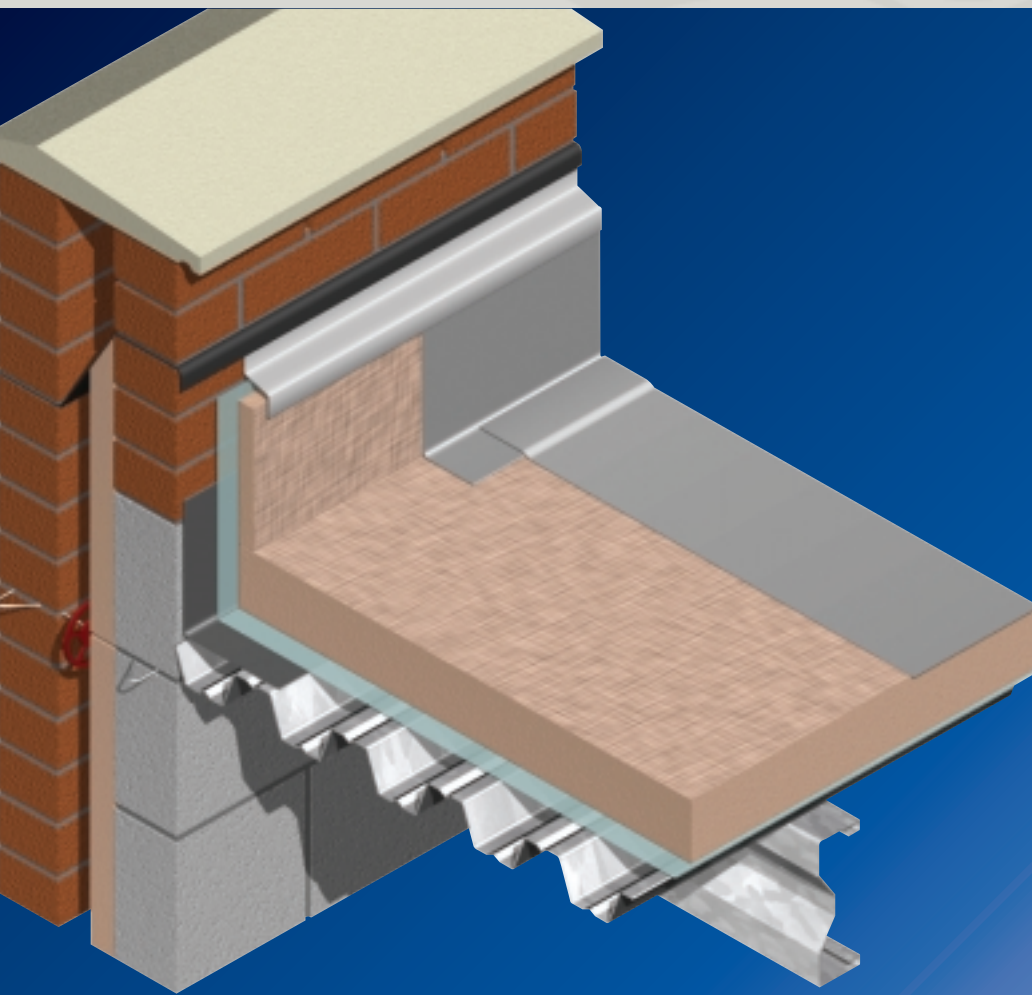


Kooltherm® K2 Roofboard

INSULATION BENEATH FULLY ADHERED SINGLE-PLY WATERPROOFING USING SOLVENT BASED ADHESIVES

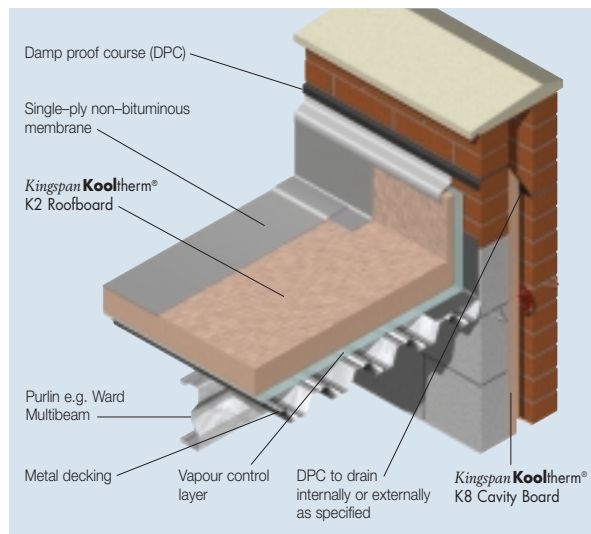


- Premium performance rigid phenolic insulation – thermal conductivity as low as 0.021 W/m·K
- Class O/Low Risk fire rating
- Negligible smoke obscuration
- Fully compatible with single-ply non-bituminous membranes fully bonded with solvent based adhesives
- Can be bonded to existing deck/vapour control layer or mechanically fixed
- Resistant to the passage of water vapour
- Easy to handle and install
- Ideal for newbuild and refurbishment
- Non-deleterious material
- CFC/HCFC-free with zero Ozone Depletion Potential (ODP)



Kooltherm® K2 Roofboard

Typical Design Detail



Specification Clause

Kingspan Kooltherm® K2 Roofboard should be described in specifications as:-

The roof insulation shall be *Kingspan Kooltherm® K2 Roofboard* ____mm thick comprising a CFC/HCFC-free rigid phenolic insulation core with a tissue based facing on both sides manufactured to the highest standards under quality control systems approved to BS 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):
J42 420, J42 427, J42 430
(Standard and Intermediate)
J42 10 (Minor Works)



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 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.

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 complete and openly publish an independently certified Ecoprofile (a type of LCA) on one of its product ranges. The Ecoprofile was carried out on the Therma zero ODP range of rigid urethane insulation products by the 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 Pembrige 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.

Wind Loadings

Kingspan Kooltherm® K2 Roofboard in conjunction with a fully adhered single-ply membrane is suitable for use with net wind loads not exceeding 2.4 kN/m² without any additional restraint (only applies to metal profiled decks. Not continuously supported decks). Additional restraint may be provided by the addition of mechanical attachment or by adding weight in the form of ballast or paving. Wind loadings should be assessed in accordance with BS 6399-2: 1997 (Loading for buildings. Code of practice for wind loads).

Roof Waterproofing

Kingspan Kooltherm® K2 Roofboard is designed for use with fully adhered single layer roof waterproofing membranes that utilise solvent based adhesives.

Falls

The fall on a flat roof should be smooth and steep enough to prevent the formation of rainwater pools. 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 can be advisable to 'design in' even greater falls. These can be provided by the use of Kingspan Insulation's Tapered Roofing Systems.

Water Vapour Control

The need for a separate vapour control layer with *Kingspan Kooltherm® K2 Roofboard* in a warm roof construction should be assessed in accordance with BS 5250: 2002 (Code of practice for control of condensation in buildings) and as defined in BS 6229: 2003. A minimum vapour control layer should consist of a 1000 gauge polythene membrane.

Roof Loading

Kingspan Kooltherm® K2 Roofboard 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.

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

Kooltherm® K2 Roofboard

Typical U-values

The following examples have been calculated using the combined method for compliance with Building Regulations/Standards revised after the year 2002. These examples are based on the use of Kingspan Kooltherm® K2 Roofboard waterproofed using a single ply membrane.

The board is laid over a bitumen based vapour control layer, which has been fully bonded to the type of deck stated for each application. The suspended ceiling, where shown, is taken to be 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 Services 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 when calculating U-values using the combined method as detailed in BS/I.S. EN ISO 6946: 1997, the type of mechanical fixing used may change the thickness of insulation required. The effect of fixings has been ignored for the purposes of these calculations. Please contact the Kingspan Insulation Technical Services Department (see rear cover) for project calculations.

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.

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 Services Department for assistance (see rear cover).

Metal Deck with no Ceiling

Insulant Thickness (mm)	U-value (W/m ² ·K)
45	0.42
50	0.38
60	0.32
70	0.28
80	0.25
85	0.23
90	0.22
95	0.21
100	0.20
110	0.18
120	0.17
125	0.16
130	0.16

Dense Concrete Deck with Suspended Ceiling

Insulant Thickness (mm)	U-value (W/m ² ·K)
40	0.45
50	0.35
55	0.32
60	0.30
70	0.26
75	0.25
80	0.23
85	0.22
90	0.21
95	0.20
100	0.19
110	0.17
120	0.16
125	0.15

Timber Deck with Suspended Ceiling

Insulant Thickness (mm)	U-value (W/m ² ·K)
40	0.44
50	0.34
55	0.31
60	0.29
70	0.26
75	0.24
80	0.23
85	0.22
90	0.21
95	0.20
100	0.19
110	0.17
120	0.16
125	0.15

Sitework

Vapour Control Layer

The specified vapour control layer should be continued 25 mm past the insulation abutting the parapet and sealed.

Fixing in Hot Bitumen

Hot bitumen (maximum temperature 240°C) is applied over the bituminous vapour control layer or existing bituminous waterproofing and the *Kingspan Kooltherm® K2 Roofboard* bedded into it, closed butted, with staggered end joints. On profiled metal decking, board joints should again be staggered ensuring board edges are fully supported on the crown flats, therefore, preventing board damage at edges.

NB In all instances board joints and cut edges should be taped with a minimum 50 mm wide 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 recommendation.

Mechanical Fixing

The number of mechanical fixings required to fix *Kingspan Kooltherm® K2 Roofboard* 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).

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: (1.2 x 0.6 m boards).

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

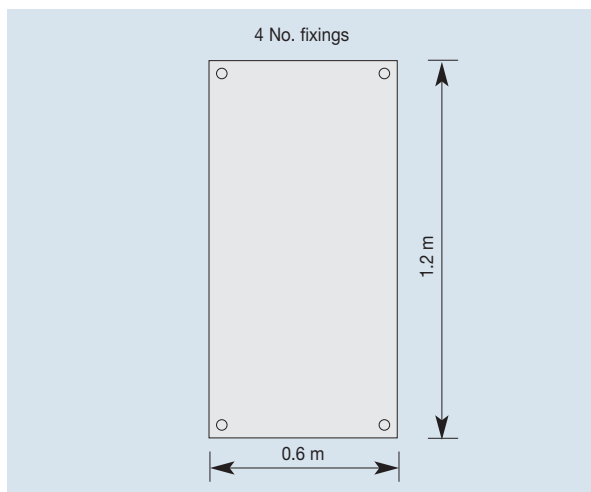


Figure 1 Typical Mechanical Fixing Pattern

On profiled metal decking, board joints should be staggered ensuring board edges are fully supported on the crown flats, therefore, preventing board damage at edges.

The single layer roof waterproofing and adhesive system should be applied strictly in accordance with the appropriate manufacturers instructions.

Perimeter Mechanical Fixings

Where perimeter mechanical fixings are specified, the minimum number and distribution should be as stated for full mechanical fixing. The extent of the perimeter mechanical fixing will depend on the design and location of the roof concerned.

Daily Working Practice

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

Cutting

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

Availability

Kingspan Kooltherm® K2 Roofboard is available through specialist insulation distributors and selected roofing merchants throughout the UK, Ireland and Europe.

Packaging

According to quantity, the boards are supplied in packs or on pallets, labelled and shrinkwrapped in polythene.

Storage

The packaging of *Kingspan Kooltherm® K2 Roofboard* should not be considered adequate for long term outside protection. Ideally, boards should be stored inside a building. If however, outside storage cannot be avoided 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.

Kooltherm® K2 Roofboard

Product Description

The Facings

Kingspan Kooltherm® K2 Roofboard is faced on both sides with a tissue based facing autohesively bonded to the insulation core during manufacture.

The Core

The core of *Kingspan Kooltherm® K2 Roofboard* is a premium performance CFC/HCFC-free rigid phenolic insulant of typical density 58–60 kg/m³.

CFC/HCFC-free

Kingspan Kooltherm® K2 Roofboard is manufactured without the use of CFCs/HCFCs and has zero Ozone Depletion Potential (ODP).



Product Data

Standards and Approvals

Kingspan Kooltherm® K2 Roofboard is manufactured to the highest standards under a quality control system approved to BS EN ISO 9001: 2000 (Quality management systems. Requirements).



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

Standard Dimensions

Kingspan Kooltherm® K2 Roofboard is available in the following standard sizes and thicknesses:

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

Insulation Compressive Strength

Typically exceeds 175 kPa at 10% compression 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 Kooltherm® K2 Roofboard* should be installed over a minimum 1000 gauge polythene vapour control layer (see 'Water Vapour Control' page 3).

Durability

If correctly applied, *Kingspan Kooltherm® K2 Roofboard* has an indefinite life. Its durability depends on the supporting structure, waterproofing and the conditions of its use.

Resistance to Solvents, Fungi and 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 spilled 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 Kooltherm® K2 Roofboard* resist attack by mould and microbial growth, and do not provide any food value to vermin.

Fire Performance

Kingspan Kooltherm® K2 Roofboard will achieve the results given below which enables it to be classified by the Building Regulations as being Class O and Low Risk by the Building Standards in Scotland.

Test	Result
BS 476-6:1989 (Fire tests on building materials and structures. Method of test for fire propagation for products)	Index of performance (1) not exceeding 12 and sub Index (i,) not exceeding 6 (for rigid phenolic insulation core)
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)	Class 1 rating
BS 5111-1:1974 (Smoke Obscuration)	< 5%

When subjected to British Standard fire tests the results are dependent on the roofing system adopted, however FAB is generally achieved.

Construction	Result
BS 476-3: 1958 (External fire exposure roof test)	Dependent on single ply membrane adopted

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

Thermal Properties

The λ -values and R-values quoted are in accordance with the principles in the Harmonised European Standard BS EN 13166: 2001 (Thermal insulation products for buildings – Factory made products of phenolic foam (PF) – 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 0.023 W/m·K (insulant thickness 25–44 mm), 0.021 W/m·K (insulant thickness \geq 45 mm).

Thermal Resistances

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)
40	1.70
45	2.10
50	2.35
55	2.60
60	2.85
70	3.30
75	3.55
80	3.80
85	4.00
90	4.25
95	4.50
100	4.75
110	5.20
120	5.70
125	5.95
130	6.15

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

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 O 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 0.022–0.028 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 Services Department on the numbers below:

UK – Telephone: +44 (0) 870 850 8555
– Fax: +44 (0) 870 850 8666
– email: commercial.uk@insulation.kingspan.com

Ireland – Telephone: +353 (0) 42 97 95000
– Fax: +353 (0) 42 97 46129
– email: commercial.ie@insulation.kingspan.com

Literature & Samples

Kingspan Insulation produce 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 – Telephone: +44 (0) 870 733 8333
– Fax: +44 (0) 1544 387 299
– email: literature.uk@insulation.kingspan.com

Ireland – Telephone: +353 (0) 42 97 95038
– Fax: +353 (0) 42 97 46129
– 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 – Telephone: +44 (0) 870 761 7770
– Fax: +44 (0) 1544 387 289
– email: tapered.uk@insulation.kingspan.com

Ireland – Telephone: +353 (0) 42 97 95032
– Fax: +353 (0) 42 97 95669
– email: tapered.ie@insulation.kingspan.com

Technical Advice/Design

Kingspan Insulation Ltd support all of their 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 **TECHLINE** 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 Services 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 Building Fabric Insulation Technical Services Department on the **TECHLINE** numbers below:

UK – Telephone: +44 (0) 870 850 8333
– Fax: +44 (0) 1544 387 278
– email: techline.uk@insulation.kingspan.com

Ireland – Telephone: +353 (0) 42 97 95032
– Fax: +353 (0) 42 97 95669
– email: techline.ie@insulation.kingspan.com

General Enquiries

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

UK – Telephone: +44 (0) 870 850 8555
– Fax: +44 (0) 870 850 8666
– email: info.uk@insulation.kingspan.com

Ireland – Telephone: +353 (0) 42 97 95000
– Fax: +353 (0) 42 97 46129
– email: info.ie@insulation.kingspan.com

Kingspan Insulation reserve 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 Sales Department. 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 left) whose advice 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 above).



Kingspan Insulation are members of the single-ply roofing association (SPRA)



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