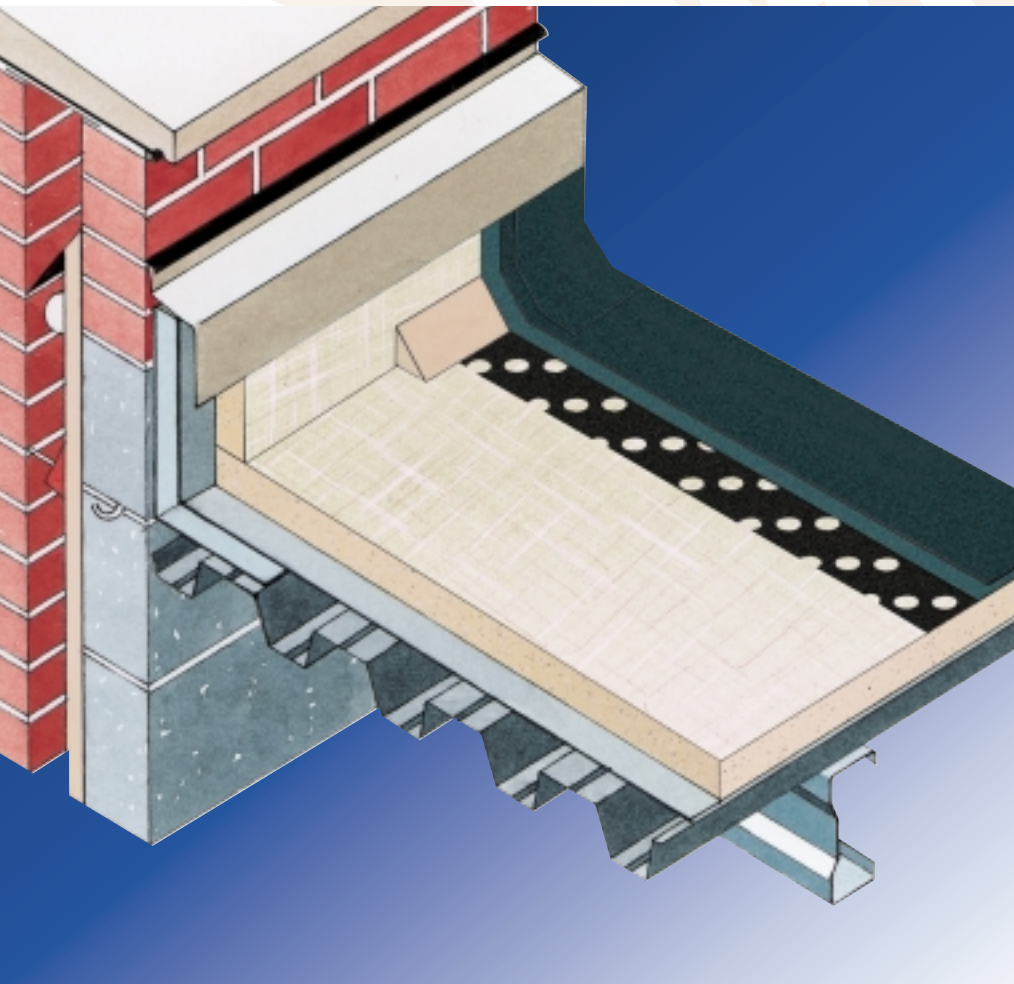


Kooltherm® K5 Roofboard

INSULATION BENEATH PARTIALLY
BONDED BUILT-UP FELT

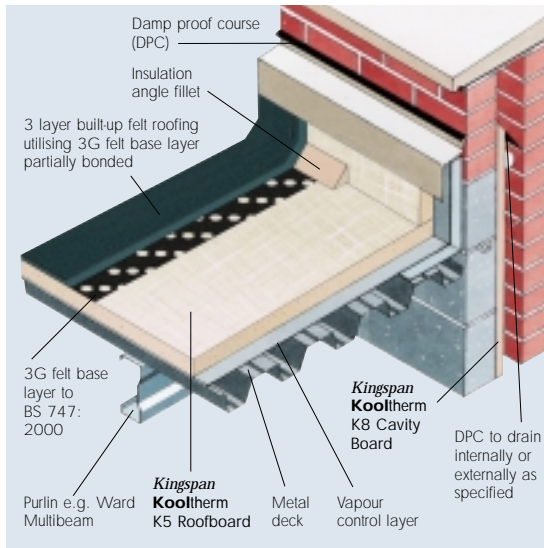


- ▼ Premium performance rigid phenolic insulation – thermal conductivity 0.018 W/m.K
- ▼ Class O fire rating
- ▼ Negligible smoke emission
- ▼ Fully compatible with most bitumen based waterproofing systems
- ▼ Resistant to the passage of water vapour
- ▼ Easy to handle and install
- ▼ Ideal for newbuild and refurbishment
- ▼ CFC-free



Kingspan **Kooltherm**® K5 Roofboard

TYPICAL DESIGN DETAIL



SPECIFICATION CLAUSE

Kingspan Kooltherm® K5 Roofboard should be described in specifications as:-

The roof insulation shall be **Kingspan Kooltherm**® K5 Roofboard ____mm thick comprising a CFC-free rigid phenolic insulation core with glass fibre tissue facings on both sides manufactured to BS EN ISO 9002: 1994 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): J41 454 (Standard and Intermediate).



DESIGN CONSIDERATIONS

WIND LOADING

Wind loading should be assessed in accordance with BS 6399: Part 2: 1997 (Code of practice for wind loads).

ROOF WATERPROOFING

Kingspan Kooltherm® K5 Roofboard is suitable for use with most bitumen based waterproofing systems including high performance types which incorporate and are compatible with a Type 3G perforated base layer to BS 747: 2000 (Specification for Roofing Felts). The 3G felt layer is laid dry and loose, mineral face down. 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: 1994 (Code of practice for built-up felt roofing). Certain approved single ply membranes are also compatible. For further information please contact the Technical Services Department (see rear cover).

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: 1982, 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**® K5 Roofboard in a warm roof construction should be assessed in accordance with BS 5250: 1989 (1995) and as defined in BS 6229: 1982. A minimum vapour control layer should consist of a coated roofing felt complying with BS 747: 2000 Type 3B, or any appropriate metal-cored vapour control layer. Allowance should be made for the adequate bonding of the vapour control layer to the deck so as to provide a suitable surface for **Kingspan Kooltherm**® K5 Roofboard to be laid upon, and sufficient resistance to wind up-lift (see 'Wind Loading').

ROOF LOADING

Depending on the chosen waterproofing system, **Kingspan Kooltherm**® K5 Roofboard is suitable for use on access roof decks subject to limited foot traffic. Where continuous or excessive loadings are liable to occur it is recommended that the roof surface is protected by promenade tiles. The roof should 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

THERMAL PROPERTIES

THERMAL CONDUCTIVITY

The boards achieve a thermal conductivity (λ -value) of 0.018 W/m.K.

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)
30	1.667
35	1.944
40	2.222
45	2.500
50	2.778
60	3.333
65	3.611
70	3.889

TYPICAL U-VALUES

The following examples have been calculated using both the combined method and the proportional area method. The combined method is required for compliance with Building Regulations / Standards revised after the year 2000. These examples are based on the use of **Kingspan Kooltherm® K5 Roofboard** waterproofed using 3 layers of built-up felt with the surface covered with mineral chippings. The board is laid over a bitumen based vapour control layer, which is 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 our 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 / IS EN ISO 6946 : 1997 (Building components and building elements. Thermal resistance and thermal transmittance. Calculation method).

Proportional Area Method – the U-values shown below were calculated using the proportional area method as detailed in The Chartered Institute of Building Services Engineers (CIBSE) Guide A3 (Thermal Properties of Building Structures).

NB when calculating U-values using the combined method as detailed in BS / IS 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 below are for guidance only. A detailed U-value calculation together with condensation risk analysis should be completed for each individual project. Please call our Technical Services Department for assistance (see rear cover).

METAL DECK WITH NO CEILING

Insulant Thickness (mm)	U-value (W/m ² .K)	
	Combined Method	Proportional Area Method
35	0.44	0.44
40	0.40	0.40
50	0.32	0.32
60	0.27	0.27
70	0.24	0.24
35+40*	0.22	0.22

*Multiple layers required as maximum thickness exceeded. First thickness refers to the inner layer, second thickness outer layer. The thermal resistance of the outer layer must be \geq that of the inner layer so as to avoid condensation.

DENSE CONCRETE DECK WITH SUSPENDED CEILING

Insulant Thickness (mm)	U-value (W/m ² .K)	
	Combined Method	Proportional Area Method
30	0.45	0.44
40	0.36	0.36
45	0.33	0.32
50	0.30	0.30
60	0.26	0.26
65	0.24	0.24
70	0.23	0.22
35+40*	0.21	0.21

*Multiple layers required as maximum thickness exceeded. First thickness refers to inner layer, second thickness outer layer. The thermal resistance of the outer layer must be \geq that of the inner layer so as to avoid condensation.

TIMBER DECK WITH PLASTERBOARD CEILING

Insulant Thickness (mm)	U-value (W/m ² .K)	
	Combined Method	Proportional Area Method
30	0.45	0.44
40	0.36	0.36
45	0.33	0.32
50	0.30	0.30
60	0.26	0.26
65	0.24	0.24
70	0.22	0.22

Kingspan **Kooltherm**® K5 Roofboard

SITWORK

VAPOUR CONTROL LAYER

Metal decks and concrete decks should be primed prior to the application of the hot bitumen used to bond the vapour control layer to the deck.

To provide an effective vapour control layer, the roofing felt should be bonded in hot bitumen to the supporting substrate with all joints lapped at least 50 mm and bonded. At all edges, abutments and penetrations the felt should be either turned back at least 150 mm onto the insulation and sealed down or turned up and sealed with the roof covering to form an envelope. Reference should be made to BS 8217: 1994 (Code of practice for built-up felt roofing). Where verge/eaves details exist, the vapour control layer should be dressed accordingly to a minimum of 150 mm.

FIXING OVER METAL DECKS

On metal decks, **Kingspan Kooltherm**® K5 Roofboard should be laid into hot bitumen (max. temperature 240°C) mopped or poured over the vapour control layer. Alternatively the boards can be secured using mechanical fixing systems (see Figure 1). **Kingspan Kooltherm**® K5 Roofboard should be laid break-bonded with the long edges at right angles to the trough openings, or alternatively, 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. Taping of the joints is not required.

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 Kooltherm**® K5 Roofboard to the vapour control layer by laying into hot bitumen mopped or poured over the vapour control layer. Alternatively the boards can be secured using mechanical fixing systems (see Figure 1). The boards should be laid break-bonded with all joints lightly butted.

FIXING OVER PLYWOOD DECKS

Kingspan Kooltherm® K5 Roofboard should be fully bedded in hot bitumen over a continuous vapour control layer which has been nailed or bonded to the deck with laps at the side and end sealed with hot bitumen. Alternatively the boards can be secured using mechanical fixing systems (see Figure 1). The joints should be break-bonded and the boards laid at right angles to the edge of the roof or diagonally across the roof. All joints should be lightly butted.

FIXING OVER TONGUE AND GROOVE DECKS

On timber tongue and groove decks, the vapour control layer should be nailed. During the laying of **Kingspan Kooltherm**® K5 Roofboard the nail heads will become sealed in hot bitumen to the vapour control layer by the subsequent bonding of the roofboard. The **Kingspan Kooltherm**® K5 Roofboard is then applied as described under plywood decks.

FIXING OVER WOODWOOL DECKS

On woodwool slab decks, **Kingspan Kooltherm**® K5 Roofboard should be fully bedded in hot bitumen over a continuous vapour control layer. Boards should be laid with their long edges at right angles to the slabs, or preferably diagonally across the roof. Alternatively boards can be secured using specialist mechanical fixing systems (see Figure 1). Board joints should not coincide with those of the slabs. The roof boards should be laid break-bonded, with all joints lightly butted.

MECHANICAL FIXINGS

The number of mechanical fixings required to fix **Kingspan Kooltherm® K5 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 (70 mm x 70 mm or 75 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: (1200 x 600 mm boards).

The requirement for additional fixings should be assessed in accordance with BS 6399: Part 2: 1997 (Code of practice for wind loads) (see Figure 1).

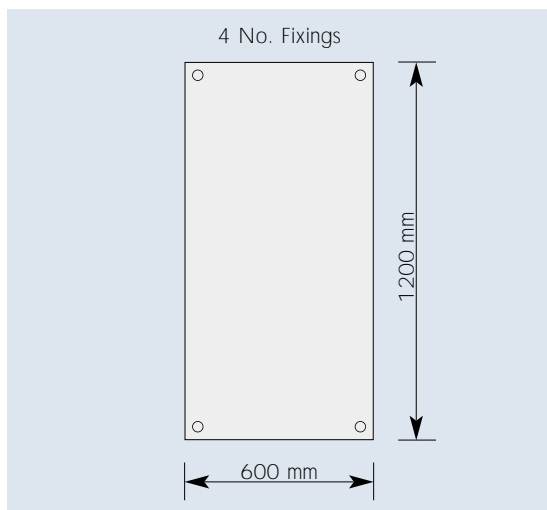


Figure 1 TYPICAL MECHANICAL FIXING PATTERN

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.

REFLECTIVE COATINGS

Bitumen based built up waterproofing systems laid over **Kingspan Kooltherm® K5 Roofboard** 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, 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® K5 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® K5 Roofboard** should not be considered adequate for long term outside protection. Ideally boards should be stored inside a building. If 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 our Technical Services 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.

Kingspan **Kooltherm**® K5 Roofboard

PRODUCT DESCRIPTION

THE FACINGS

Kingspan Kooltherm® K5 Roofboard is faced on both sides with glass fibre tissue autohesively bonded to the insulation core during manufacture.

THE CORE

The core of **Kingspan Kooltherm**® K5 Roofboard is a high performance CFC-free rigid phenolic insulant of typical density 58-60 kg/m³.

CFC-FREE*

Kingspan Kooltherm® K5 Roofboard is produced using alternative blowing agents in compliance with the Montreal Protocol.

* **Kingspan Kooltherm**® K5 Roofboard is also available CFC/HCFC-free subject to enquiry.

PRODUCT DATA

STANDARDS AND APPROVALS

Kingspan Kooltherm® K5 Roofboard is manufactured to the highest standards under a quality control system approved to BS EN ISO 9002: 1994 (Quality systems. Model for quality assurance in production, installation and servicing).



STANDARD DIMENSIONS

Kingspan Kooltherm® K5 Roofboard is available in the following standard sizes and thicknesses:

Nominal Dimension	Availability
Length (m)	1.2*
Width (m)	0.6
Insulant Thickness** (mm)	30, 35, 40, 45, 50 60, 65, 70

* 1.16 m for insulant thicknesses over 50 mm.

** Other thicknesses are available subject to quantity.

INSULATION COMPRESSIVE STRENGTH

Typically exceeds 175 kPa at 10% compression when tested to BS 4370: Part 1: 1988 (1996) (Methods of test for rigid cellular materials).

WATER VAPOUR RESISTANCE

The boards achieve a resistance greater than 15 MN.s/g, when tested in accordance with BS 4370: Part 2: 1993. **Kingspan Kooltherm**® K5 Roofboard should always be installed over a separate felt vapour control layer as detailed in 'Water Vapour Control' page 2.

DURABILITY

If correctly applied, **Kingspan Kooltherm**® K5 Roofboard has an indefinite life. Its durability depends on the supporting structure, waterproofing and the conditions of its use.

RESISTANCE TO SOLVENTS, FUNGI & RODENTS

The insulation core is resistant to dilute acids, alkalis, mineral oil and petrol. It 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 **Kingspan Kooltherm**® K5 Roofboard. Boards which have been in contact with harsh solvents, petrol, mineral oil or acids, or boards that have been damaged in any other way should not be used.

The insulation core and facings used in the manufacture of **Kingspan Kooltherm**® K5 Roofboard resist attack by mould and microbial growth and do not provide any food value to vermin.

FIRE PERFORMANCE

The rigid phenolic insulation core of **Kingspan Kooltherm**® K5 Roofboard will achieve the results given below which enable them to be classified by the Building Regulations as being Class O rated.

Flat roofs insulated with **Kingspan Kooltherm**® K5 Roofboard when subjected to British Standard fire tests achieve the following typical results 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. Further details on the fire performance of Kingspan Insulation products may be obtained from the Technical Services Department (see rear cover).

Test	Result
BS 476: Part 3: 1975 (External fire exposure roof test)	FAA rating
BS 476: Part 6: 1989 (Fire Propagation Test)	Index of performance (I) not exceeding 12 and sub-index (i ₁) not exceeding 6 (for rigid phenolic insulation core and facings)
BS 476: Part 7: 1997 (Surface Spread of Flame Test)	Class 1 rating for rigid phenolic insulation core and facings
BS 5111: Part 1: 1974 (Smoke Obscuration)	< 5%

KINGSPAN INSULATION

Kingspan Insulation offers an extensive range of premium and high performance insulation products, breathable membranes and pre-fabricated / pre-insulated systems for the construction industry. Following an extensive investment programme, Kingspan Insulation is continuing to lead the insulation industry by manufacturing the majority of its insulation products with zero Ozone Depletion Potential (ODP) and quoting thermal performance data in accordance with the new harmonised European Standard.

Kingspan Insulation Limited specialise in the solution of insulation problems. Our range of insulation products which meet the exacting requirements of the construction industry are produced to the highest standards, including BS EN ISO 9002: 1994 and IS EN ISO 9002: 1994. Each product has been designed to fulfil a specific need and has been manufactured to precise standards and tolerances.

INSULATION FOR:

- PITCHED ROOFS
- FLAT ROOFS
- CAVITY WALLS
- TIMBER AND STEEL FRAMING
- EXTERNALLY INSULATED CLADDING SYSTEMS
- FLOORS
- SOFFITS

INSULATED DRY LINING

TAPERED ROOFING SYSTEMS

Kingspan KoolDuct® PRE-INSULATED DUCTING

Kingspan nilvent™ BREATHABLE MEMBRANES

Kingspan TEK Haus™ BUILDING SYSTEM

THE KINGSPAN INSULATION PRODUCT RANGE

THE KINGSPAN KOOLTHERM® K-RANGE

- With a thermal conductivity of 0.018 W/m.K 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.
- Achieves the best possible rating of <5% smoke emission when tested to BS 5111: Part 1: 1974.
- CFC-free / available CFC/HCFC-free with zero Ozone Depletion Potential subject to enquiry.

THE KINGSPAN THERMA ZERO ODP RANGE

- With a thermal conductivity of 0.022-0.026 W/m.K zero ODP 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 ZERO ODP 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 – masks are not required, as Kingspan Insulation products do not produce loose dust or irritant fibres.
- Provide reliable long term thermal performance over the lifetime of the building.

CUSTOMER SERVICE

For quotations, order placement and details of despatches please contact our Building Fabric 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

TECHNICAL ADVICE

Kingspan Insulation Ltd support all of their products with a comprehensive Technical Advisory Service for specifiers, stockists and contractors.

This includes a free computer-aided service designed to give fast, accurate technical advice. Simply phone our **TECHLINE** with your project specification and we can run calculations to provide U-values, condensation/dew point risk, required insulation thicknesses etc... Thereafter we can run any number of permutations to help you achieve your desired targets.

We can also give general application advice and advice on design detailing and fixing etc... Site surveys are also undertaken as appropriate.

Please contact our Building Fabric Insulation Technical Services Department on the **TECHLINE** numbers below:



UK: – Telephone: +44 (0) 870 850 8555
– Fax: +44 (0) 1544 387 278
– email: techline.uk@insulation.kingspan.com
Ireland: – Telephone: +353 (0) 42 97 95032
– Fax: +353 (0) 42 97 46129
– email: techline.ie@insulation.kingspan.com

LITERATURE AND 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, on CD-ROM or as individual product brochures, Kingspan Insulation technical literature is an essential specification tool. For copies please contact our Marketing Department on the numbers below:

UK – Telephone: +44 (0) 1544 387 210
– 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

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. 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 free 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 our Marketing Department (see above).



Kingspan Insulation

Pembridge, Leominster, Herefordshire HR6 9LA, UK
Castleblayney, County Monaghan, Ireland

www.insulation.kingspan.com