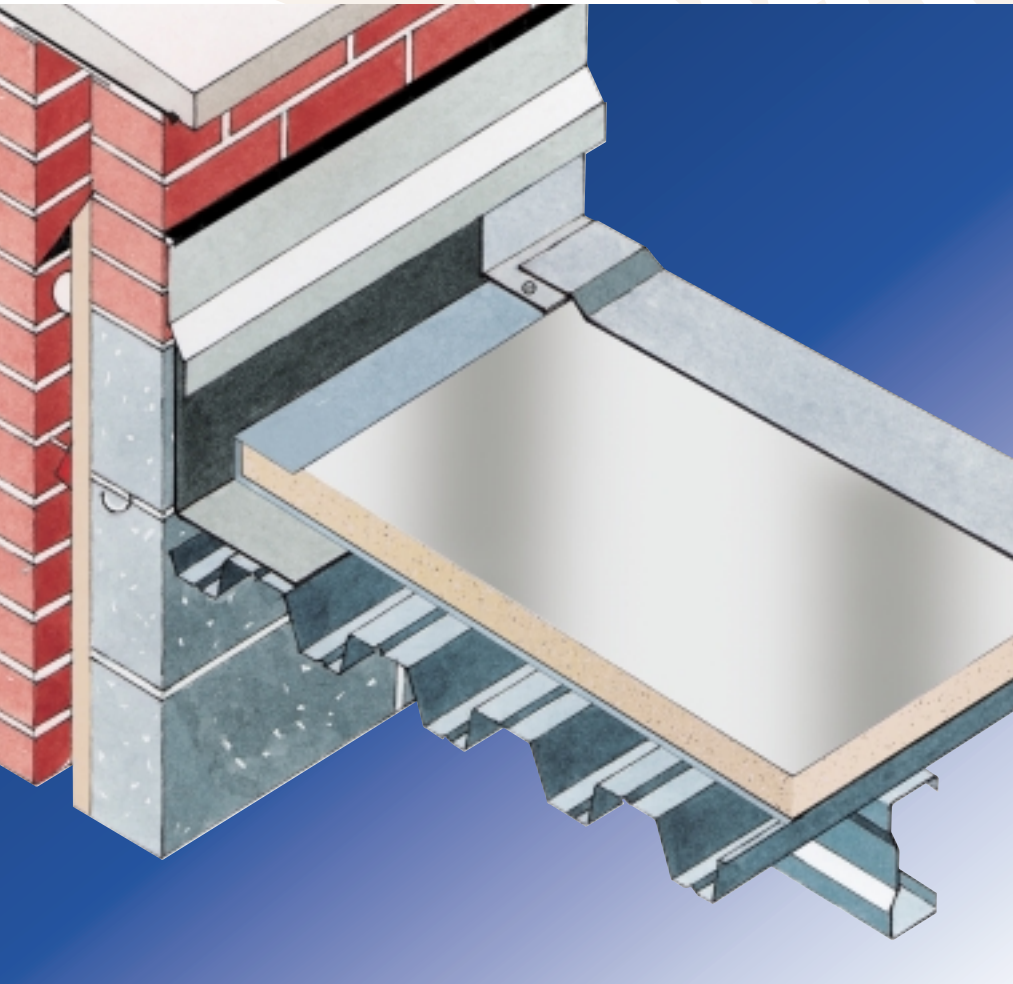


Kooltherm® K1 Roofboard

INSULATION BENEATH MECHANICALLY
FIXED FM APPROVED SINGLE-PLY
NON-BITUMINOUS WATERPROOFING

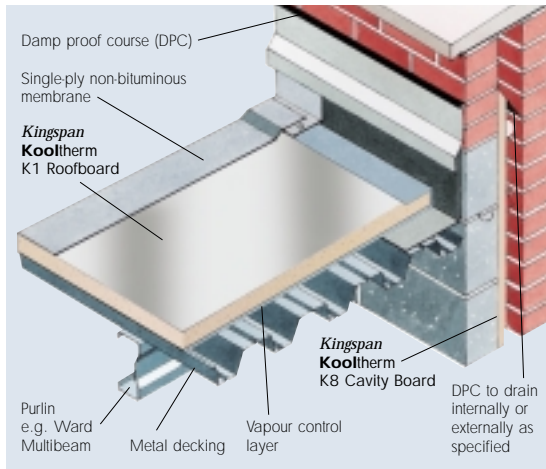


- ▼ Premium performance rigid phenolic insulation – thermal conductivity 0.018 W/m.K
- ▼ Class O fire rating
- ▼ Negligible smoke emission
- ▼ Approved by Factory Mutual Research Corporation for steel deck roof assemblies
- ▼ Fully compatible with all mechanically fixed PVC and EPDM single-ply waterproofing systems
- ▼ Installation technique is ideal for fast track building programmes
- ▼ Foil facings are resistant to the passage of water vapour
- ▼ Easy to handle and install
- ▼ Ideal for newbuild and refurbishment
- ▼ CFC-free



Kingspan **Kooltherm**[®] K1 Roofboard

TYPICAL DESIGN DETAIL



SPECIFICATION CLAUSE

Kingspan Kooltherm[®] K1 Roofboard should be described in specifications as:-

The roof insulation shall be **Kingspan Kooltherm**[®] K1 Roofboard ___mm thick, approved by Factory Mutual Research, USA, comprising a CFC-free rigid phenolic insulation core with low emissivity composite foil 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):

I42 110 (Standard and Intermediate).



DESIGN CONSIDERATIONS

WIND LOADING

Wind loadings should be assessed in accordance with BS 6399: Part 2: 1997 (Code of practice for wind loads). Mechanical fixings should be Factory Mutual approved.

ROOF WATERPROOFING

Kingspan Kooltherm[®] K1 Roofboard is suitable for use with most mechanically fixed PVC or EPDM waterproofing membranes.

Please Note: **Kingspan Kooltherm**[®] K1 Roofboard is not suitable for use with bitumen based built-up roofing systems or mastic asphalt. For these applications **Kingspan Kooltherm**[®] K5 Roofboard should be specified.

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**[®] K1 Roofboard in a warm roof construction should be assessed in accordance with BS 5250: 1989 (1995) and as defined in BS 6229: 1982.

Kingspan Kooltherm[®] K1 Roofboard should be installed over a suitable FM approved vapour control layer or isolating membrane.

ROOF LOADING

Kingspan Kooltherm[®] K1 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. 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 |

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) |
|-------------------------|--|
| 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® K1 Roofboard** waterproofed using a single-ply membrane. The board is laid over a FM approved vapour control layer laid directly over a metal deck. The suspended ceiling, where shown is taken to be 12.5 mm plaster board 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. For the purposes of these calculations, the use of telescopic/tube fasteners where the thermal conductivity of the fastener, or part of it, is less than 1 W/m.K has been assumed for both the insulation and waterproofing membrane. Please contact the Kingspan Insulation Technical Services Department (see rear cover) for project calculations.

In the event the type of fastener should differ from above please provide the following additional information for both the insulation and waterproofing membrane.

- The thermal conductivity (W/m.K) of the fastener
- The cross sectional area (mm²) of one fastener
- The number of fasteners per square metre of the membrane

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 contact the Kingspan Insulation Technical Services Department (see rear cover) for project calculations.

METAL DECK WITH NO CEILING

| Insulant Thickness (mm) | U-value (W/m ² .K) | |
|-------------------------|-------------------------------|---------------------------|
| | Combined Method | Proportional Area Method) |
| 40 | 0.41 | 0.40 |
| 50 | 0.33 | 0.33 |
| 60 | 0.28 | 0.28 |
| 70 | 0.24 | 0.24 |
| 40+40* | 0.21 | 0.21 |

*Multiple layers required as maximum thickness exceeded

DENSE CONCRETE DECK WITH SUSPENDED CEILING

| Insulant Thickness (mm) | U-value (W/m ² .K) | |
|-------------------------|-------------------------------|---------------------------|
| | Combined Method | Proportional Area Method) |
| 35 | 0.41 | 0.41 |
| 40 | 0.37 | 0.36 |
| 45 | 0.33 | 0.33 |
| 50 | 0.31 | 0.30 |
| 60 | 0.26 | 0.26 |
| 65 | 0.24 | 0.24 |
| 70 | 0.23 | 0.23 |
| 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.

Kingspan **Kooltherm**® K1 Roofboard

SITWORK

FM COMPLIANCE

Kingspan Kooltherm® K1 Roofboard should be fixed in accordance with the Factory Mutual specification for Class 1 Steel Deck constructions using other FM approved roof components.

VAPOUR CONTROL LAYER

The specified vapour control layer should have a minimum 150 mm side and end laps which should be adequately sealed. The membrane should also be turned up, but not sealed, to all vertical surfaces which abut the roof, to a minimum height of 250 mm and should overhang the verge or gutter by the same amount. Before applying the roof finish, the projecting 250 mm of the vapour control layer should be turned over the insulation and sealed down to form an envelope.

FIXING OVER METAL DECKS

On metal decks, **Kingspan Kooltherm**® K1 Roofboard should be laid over the vapour control layer or isolating layer. The boards are normally secured using mechanical fixings and washers. The waterproofing is also mechanically fixed (see 'Mechanical Fixings'). The **Kingspan Kooltherm**® K1 Roofboard boards should be laid break-bonded with their 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 is not required.

FIXING OVER OTHER DECKS

Other types of deck may not conform to Factory Mutual specifications. Please consult our Technical Services Department (see rear cover) for advice on suitable decks. However, where a project does not call for a Factory Mutual approved deck **Kingspan Kooltherm**® K1 Roofboard can be used in conjunction with most types of roof decks including timber, woodwool and concrete.

MECHANICAL FIXING

The number of mechanical fixings required to fix **Kingspan Kooltherm**® K1 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). The requirements for securing the waterproofing membrane should be considered separately.

A minimum 11 No. fixings should be placed within the individual board area and be sited >50 mm & <150 mm from the edges and corners of the board giving a minimum fixing rate of 3.8 fixings per square metre: (2400 x 1200 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).

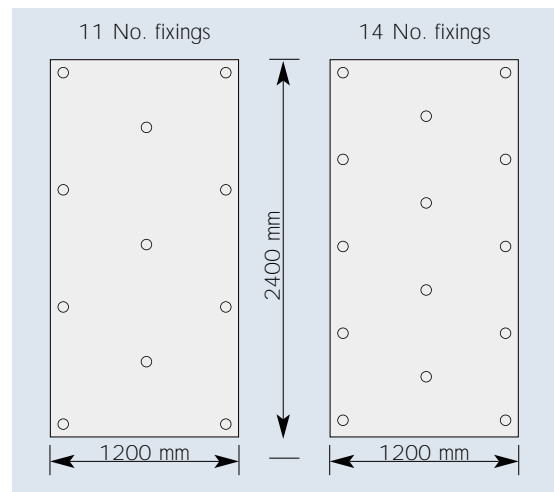


Figure 1 TYPICAL MECHANICAL FIXING PATTERNS

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.

DAILY WORKING PRACTICE

The foil face of **Kingspan Kooltherm® K1 Roofboard** should not be considered as temporary waterproofing. Boards should be waterproofed as soon as possible after fixing.

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 foil facing on the other side. Ensure accurate trimming to achieve close butting joints and continuity of insulation.

AVAILABILITY

Kingspan Kooltherm® K1 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® K1 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 our Technical Services Department (see rear cover).

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 board 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.

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**® K1 Roofboard

PRODUCT DESCRIPTION

THE FACINGS

Kingspan Kooltherm® K1 Roofboard is faced on both sides with a low emissivity composite foil facing autohesively bonded to the insulation core during manufacture. The foil facing is highly resistant to the transmission of water vapour.

THE CORE

The core of **Kingspan Kooltherm**® K1 Roofboard is a CFC-free phenolic insulant of typical density 58-60 kg/m³.

CFC-FREE*

Kingspan Kooltherm® K1 Roofboard is produced using alternative blowing agents in compliance with the Montreal Protocol.

***Kingspan Kooltherm**® K1 Roofboard is also available CFC/HCFC-free subject to enquiry.

PRODUCT DATA

STANDARDS AND APPROVALS

Kingspan Kooltherm® K1 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® K1 Roofboard is available in the following standard sizes and thicknesses:

| Nominal Dimension | Availability |
|---------------------------|-----------------------------|
| Length (m) | 2.4 (1.2*) |
| Width (m) | 1.2* (0.6) |
| Insulant Thickness** (mm) | 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

Modified to include board facings, the boards achieve a resistance greater than 100 MN.s/g when tested in accordance with BS 4370: Part 2: 1993.

DURABILITY

If correctly applied, **Kingspan Kooltherm**® K1 Roofboard 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 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**® K1 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**® K1 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**® K1 Roofboard will achieve the results given below which enables it to be classified by the Building Regulations as being Class O rated.

Flat roofs insulated with **Kingspan Kooltherm**® K1 Roofboard, when subjected to British Standard fire tests, achieve the following typical results. Further details on the fire performance of Kingspan Insulation products may be obtained from our Technical Services Department (see rear cover).

| Test | Result |
|---|--|
| BS 476: Part 3: 1975 (External fire exposure roof test) | Dependent on single ply membrane adopted |
| 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) |
| 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% |

INSURANCE RATING

Kingspan Kooltherm® K1 Roofboard is certified by the Factory Mutual Research Corporation, USA as meeting the Factory Mutual Research Standard 4450 (1989) and 4470 (1986). Approval requirements for Class 1 Insulated Steel Deck Roofs with all FM approved single-ply waterproofing systems.

Factory Mutual Certificate No. JI ODOA3.AM



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).



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