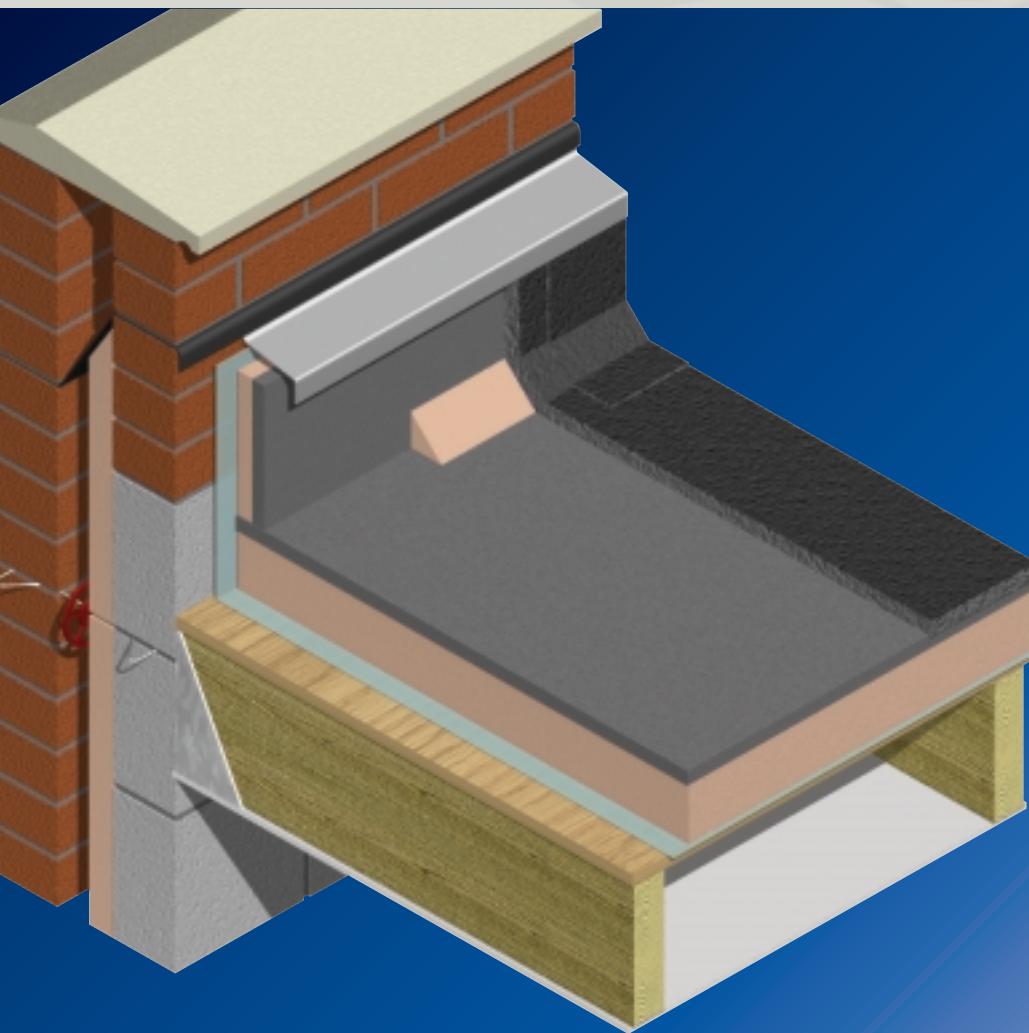


Kooltherm® K11 Roofboard

INSULATION BENEATH FULLY BONDED TORCH APPLIED MULTI-LAYER BITUMINOUS WATERPROOFING SYSTEMS

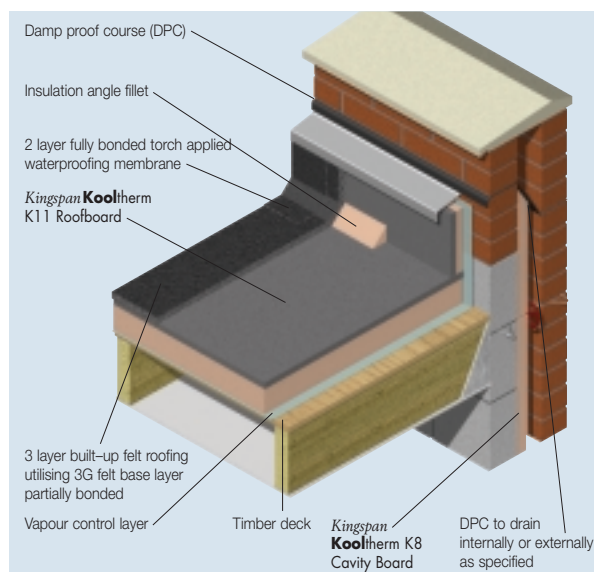


- Premium performance rigid phenolic insulation – thermal conductivity as low as 0.021 W/m·K
- Class O/Low Risk fire rating
- Negligible smoke obscuration
- Compatible with torch applied waterproofing systems
- No requirement for a 3G ventilating layer
- Offers good resistance to foot traffic
- Resistant to the passage of water vapour
- Easy to handle and install
- Ideal for newbuild or refurbishment
- Non-deleterious material
- CFC/HCFC-free with zero Ozone Depletion Potential (ODP)



Kooltherm® K11 Roofboard

Typical Design Detail



Specification Clause

Kingspan Kooltherm® K11 Roofboard should be described in specifications as:-

The roof insulation shall be *Kingspan Kooltherm® K11 Roofboard* comprising 20 mm bitumen coated perlite facing bonded to a ___ mm thick CFC/HCFC-free rigid phenolic insulation core during manufacture by Kingspan Insulation Limited under a quality management system 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 420, J41 430
(Standard and Intermediate)
J41 10 (Minor Works)



Design Considerations

Wind Loading

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® K11 Roofboard is designed for use with 2 layer fully bonded torch applied waterproofing systems. The roof waterproofing should be applied as soon as possible after the laying of the boards. The roof waterproofing should be laid where applicable in accordance with BS 8217: 2005 (Reinforced bitumen membranes for roofing. Code of practice).

Please note: Kingspan Kooltherm® K11 Roofboard is unsuitable for use with partially bonded torch applied waterproofing systems.

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® K11 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 coated roofing felt complying with BS 747: 2000 (Reinforced bitumen sheets for roofing. Specification) 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® K11 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*[®] K11 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 be 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. The completed roof must not be used for the storage of heavy building components such as bricks or air condition 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 the year 2002. These examples are based on the use of *Kingspan Kooltherm*[®] K11 Roofboard waterproofed with 2 layer fully bonded, torch applied waterproofing membrane, finished with 10 mm mineral chippings. 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.

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).

Kooltherm® K11 Roofboard

Metal Deck with no Ceiling

Product Thickness* (mm)	U-value (W/m ² ·K)
60	0.41
65	0.35
75	0.30
80	0.28
85	0.26
90	0.25
95	0.23
100	0.22
110	0.20
120	0.18
125	0.18
135	0.16
140	0.16

*Product thickness = insulant thickness + 20 mm perlite

Dense Concrete Deck with Suspended Plasterboard Ceiling

Product Thickness* (mm)	U-value (W/m ² ·K)
55	0.41
65	0.33
70	0.30
75	0.28
85	0.25
90	0.23
95	0.22
100	0.21
105	0.20
110	0.19
115	0.18
125	0.17
135	0.16
140	0.15

*Product thickness = insulant thickness + 20 mm perlite

Timber Deck with Plasterboard Ceiling

Product Thickness* (mm)	U-value (W/m ² ·K)
55	0.40
65	0.32
70	0.30
75	0.28
80	0.26
85	0.25
90	0.23
95	0.22
105	0.20
110	0.19
115	0.18
125	0.17
135	0.16
140	0.15

*Product thickness = insulant thickness + 20 mm perlite

Sitework

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.

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

Fixing over Metal Decks

On metal decks, *Kingspan Kooltherm® K11 Roofboard* should be 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. Alternatively the boards can be secured using mechanical fixing systems (see Figure 1). *Kingspan Kooltherm® K11 Roofboard* should be laid break-bonded with its 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 the deck supports all joints. The joints should be lightly butted.

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® K11 Roofboard* 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. 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® K11 Roofboard 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 bonded to the deck with laps at the side and end sealed with either the use of hot bitumen or one the alternative proprietary adhesive systems as detailed previously. 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*[®] K11 Roofboard 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. The *Kingspan Kooltherm*[®] K11 Roofboard is then applied as described under plywood decks.

Fixing over Woodwool Decks

On woodwool slab decks, *Kingspan Kooltherm*[®] K11 Roofboard 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. 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.

Pitched or Sloping Roofs

Any provision for mechanical fixing of the waterproofing layer or layers, to prevent slippage of the cap sheet, should be made prior to the application of *Kingspan Kooltherm*[®] K11 Roofboard.

Mechanical Fixings

The number of mechanical fixings required to fix *Kingspan Kooltherm*[®] K11 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 5 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 4.16 fixings per square metre: (1.2 x 1.0 m boards).

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

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. The fixings should cover a distance of not less than two metres from the edge of the roof. The area to be mechanically fixed should extend around the complete perimeter of the roof.

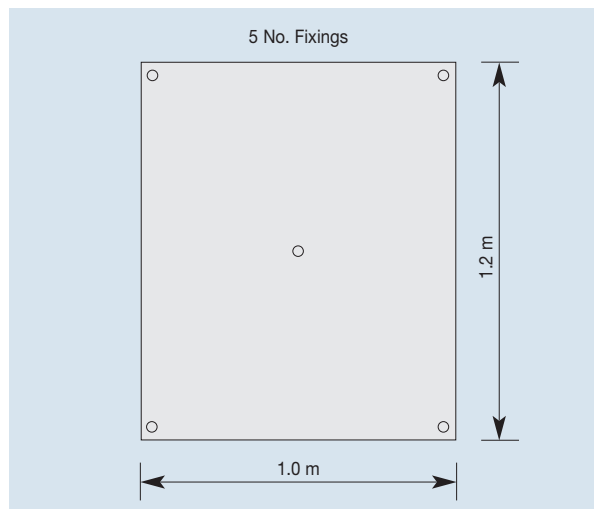


Figure 1 Typical mechanical fixing patterns

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

Kingspan Kooltherm[®] K11 Roofboard can be cut easily and cleanly using a fine toothed saw to fit roof openings and fixtures. Do not attempt to snap the board. Ensure accurate trimming to achieve close butting joints and continuity of insulation.

Availability

Kingspan Kooltherm[®] K11 Roofboard is available through specialist insulation distributors and selected roofing merchants throughout the UK, Ireland and Europe.

Packaging

The boards are supplied palletised in labelled packs shrinkwrapped in polythene.

Storage

The packaging of *Kingspan Kooltherm*[®] K11 Roofboard should not be considered adequate for outside protection. Ideally, boards should be stored inside a building. However, storage outside is permissible provided the boards are stacked clear of the ground and covered with a securely anchored polyethylene sheet.

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.

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

Kooltherm® K11 Roofboard

Product Description

The Upper Facing

The top facing of *Kingspan Kooltherm® K11 Roofboard* is a bonded bitumen coated perlite board manufactured from expanded, milled volcanic perlite rock particles formed into a board and treated during manufacture with a bitumen emulsion.

The Core

The core of *Kingspan Kooltherm® K11 Roofboard* is a premium performance CFC/HCFC-free rigid phenolic insulant of typical density 40 kg/m³.

The Lower Facing

The lower facing of *Kingspan Kooltherm® K11 Roofboard* is a tissue based facing bonded to the insulation core during manufacture.

CFC/HCFC-free

Kingspan Kooltherm® K11 Roofboard is manufactured without the use of CFC/HCFCs and has zero Ozone Depletion Potential (ODP).



Product Data

Standard Dimensions

Kingspan Kooltherm® K11 Roofboard is available in the following standard size and thicknesses:

Nominal Dimension	Availability
Length (m)	1.2
Width (m)	1.0
Perlite Thickness (mm)	20
Insulant Thickness (mm)	Refer to local distributor or Kingspan Insulation Price List for current stock and non-stock sizes.

Insulation Compressive Strength

Typically exceeds 150 kPa at 10% compression when tested to BS EN 826: 1996 (Thermal insulating products for building applications. Determination of compression behaviour).

Water Vapour Resistance

The boards achieve a resistance greater than 15 MN·s/g, when tested in accordance with BS EN 12086: 1997 (Thermal insulating products for building applications. Determination of water vapour transmission properties). *Kingspan Kooltherm® K11 Roofboard* should always be installed over a separate vapour control layer (see 'Water Vapour Control' page 2).

Durability

If correctly applied, *Kingspan Kooltherm® K11 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 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® K11 Roofboard* resist attack by mould and microbial growth, and do not provide any food value to vermin.

Fire Performance

Kingspan Kooltherm® K11 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 (I) 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%

Flat roofs insulated with *Kingspan Kooltherm® K11 Roofboard* when subjected to British Standard fire tests achieve the following typical results, when waterproofed with 2 layer, torch applied waterproofing membrane, finished with 10 mm mineral 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 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 thermal conductivity (λ -value) of the perlite component of *Kingspan Kooltherm*® K11 Roofboard is 0.050 W/m·K.

The thermal conductivity of the insulation core of *Kingspan Kooltherm*® K11 Roofboard is 0.023 W/m·K (insulant thickness 25–44 mm), 0.021 W/m·K (insulant thickness \geq 45 mm).

Thermal Resistance

Thermal resistance (R-value) varies with the thickness of each component. It is calculated by dividing the thickness of each component (expressed in metres) by its thermal conductivity and adding the resultant figures together.

*Product Thickness (mm)	Thermal Resistance (m ² ·K/W)
50	1.70
55	1.90
60	2.10
65	2.50
70	2.75
75	3.00
85	3.45
90	3.70
95	3.95
100	4.20
105	4.40
110	4.65
115	4.90
120	5.15

*Product thickness = insulant thickness + 20 mm perlite board.

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*® & *Purcrete* 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 Ltd

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

www.insulation.kingspan.com