Fourth Issue | 08/2022

Kooltherm®
K110 PLUS Soffit Board

Insulation for structural ceilings (Soffits)

- Premium performance rigid thermoset phenolic insulation - thermal conductivity of 0.019 W/mK
- Impact resistant building board
- Unaffected by air infiltration
- Resistant to the passage of water vapour
- Easy to handle
- Quick to install
- Ideal for new build and refurbishment
- Non-deleterious material
- Manufactured with a blowing agent that has zero ODP and low GWP

Fibre-free Core

EVEN THINNER LOWER λ EVEN BETTER

Kingspan®

Typical constructions and U-values

Assumptions

The U-values in Table 1 have been calculated using the method detailed in BS EN ISO 6946: 2017 (Building components & building elements. Thermal resistance & thermal transmittance. Calculation methods), and using the conventions set out in BR 443 (Conventions for U-value calculations). They are valid for the construction shown in Figure 1.

These examples are based on the use of Kingspan Kooltherm® K110 PLUS mechanically fixed directly to the soffit of a 200 mm concrete deck using metal fixings, with a cross sectional area of 25.97mm, a thermal conductivity of 50 W/mK and number per square meter 3.82.

NB When calculating U-values to BS EN ISO 6946: 2017, the type of fixing used may change the thickness of insulation required. Please contact the Kingspan Insulation Technical Service Department (see rear cover for details) for a comprehensive U-value calculation, which will take account of the correction factor specific to the fixing.

NB For the purposes of these calculations the standard of workmanship has been assumed good, and therefore the correction factor for air gaps has been ignored.

NB The figures quoted are for guidance only. A detailed U-value calculation and a condensation risk analysis should be completed for each project.

NB If your construction is different from that specified, and / or to gain a comprehensive U-value calculation along with a condensation risk analysis of your project, please consult the Kingspan Insulation Technical Service Department for assistance (see rear cover).

U-value table key

Further information on the applicable notional and area weighted average limiting U-values is available in the relevant geographical documentation:

- Approved Documents L to the Building Regulations for England;
- Approved Documents L to the Building Regulations for Wales;
- Technical Handbooks Section 6 to the Building Standards for Scotland;
- Technical Booklets F1 & F2 to the Building Regulations for Northern Ireland; and
- Technical Guidance Document L (Dwellings) and Technical Guidance Document L (Buildings other than Dwellings) to the Building Regulations for the Republic of Ireland.

Fixed directly to concrete soffit

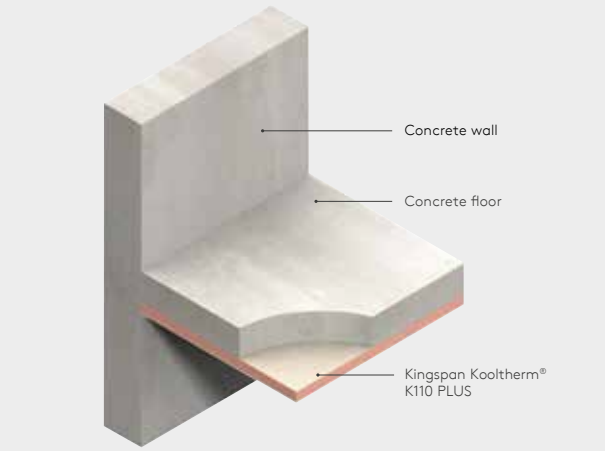


Figure 1

Product thickness* (mm)	U-values (W/m²K)
	Soffit insulation metal screw fixing
71	0.31
76	0.29
81	0.27
86	0.26
91	0.24
96	0.23
106	0.21
116	0.19
126	0.18
65** + 71	0.17
70** + 71	0.16
70** + 76	0.15

* Product thickness = insulation thickness + 6 mm building board.

** Packer board Kooltherm® K110.

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

Design considerations

Heat loss and linear thermal bridging

Basic principles

Linear thermal bridging describes the additional heat losses or gains that occur at junctions between elements e.g. where a cavity wall meets the ground or intermediate floor, or at junctions around openings in the building fabric where the thermal insulation layer is discontinuous e.g. sills, jambs and lintels.

Interruptions within the insulation layer by materials with poorer insulating properties can result in a thermal bridge, which in turn can lead to problems of internal surface condensation and mould growth, especially if there is a drop in surface temperature.

The heat flow at these junctions and opening locations, over and above that through the adjoining plane elements, is the linear thermal transmittance of the thermal bridge: measured in W/mK; referred to as a `psi-value'; and expressed as a `ψ-value'.

The lower the ψ-value, the better the performance. ψ-values are taken into account in the calculation methodologies e.g. the Standard Assessment Procedure (SAP) that are used to assess the operational CO_2 emissions and, where applicable, the fabric energy efficiency of buildings, primary energy or delivered energy rates.

ψ-values can comprise either, or a combination of, calculated and assumed values.

Approved details, such as the Acceptable Construction Details (Republic of Ireland) can uplift performance to provide a clear starting point towards achieving compliance, but can be limited in scope and applicability. The greatest opportunity for mitigating the impact of linear thermal bridges can come from following accurately 'modelled' details that take into account the following design considerations.

Reducing linear thermal bridging

For soffit constructions, supporting beams and columns interrupting the insulation layer can represent significant thermal bridges, which can adversely affect the thermal performance of the floor if not suitably handled. Thermally, the best approach is to fully box around beams with appropriate Insulation to limit these losses. For further advice on reducing linear and point thermal bridging, please contact Kingspan Insulation's Technical Service Department (see rear cover for details).

Environmental impact & responsible sourcing

Environmental Product Declaration

An Environmental Product Declaration (EPD), certified by BRE Global to the BRE Environmental Profiles 2013 Product Category Rules for Type III environmental product declaration of construction products to EN 15804: 2012 + A1: 2013, has been created for the Kingspan Kooltherm® K110 PLUS baseboard produced at Kingspan Insulation's Pembridge, Herefordshire manufacturing facility.

Responsible sourcing

Kingspan Kooltherm® K110 PLUS produced at Kingspan Insulation's Pembridge, Herefordshire manufacturing facility is certified to BES 6001 (Framework Standard for the Responsible Sourcing of Construction Products) 'Very Good'.

BES 6001
Responsible Sourcing
www.greenbooklive.com

NB The above information is correct at the time of writing. Confirm at the point of need by visiting the Kingspan Insulation website (see rear cover for details) from which a copy of Kingspan Insulation's certificates can be obtained.

Sustainability & responsibility

Kingspan Insulation has a long-term commitment to sustainability and responsibility: as a manufacturer and supplier of insulation products; as an employer; as a substantial landholder; and as a key member of its neighbouring communities.

A report covering the sustainability and responsibility of Kingspan Insulation Ltd's British operations at its Pembridge, Herefordshire and Selby, North Yorkshire manufacturing facilities is available at **www.kingspaninsulation.co.uk/sustainabilityandresponsibility.**

Design considerations

Specification clause

Kingspan Kooltherm® K110 PLUS should be described in specifications as:

The soffit insulation shall be Kingspan Kooltherm® K110 PLUS Soffit Board ____ mm thick: comprising a premium performance fibre-free rigid thermoset phenolic insulation core with a glass tissue based facing on its inner face and a low emissivity composite foil on its outer face. The product shall have a thermal conductivity of 0.019 W/mK. The product shall be manufactured: with a blowing agent that has zero Ozone Depletion Potential (ODP) and low Global Warming Potential (GWP); under a management system certified to ISO 9001: 2015, ISO 14001: 2015, ISO 45001: 2018 and ISO 50001: 2018; by Kingspan Insulation Limited; and installed in accordance with the instructions issued by them.

Product classifications

Uniclass UK

Pr_25_71_63_59 Phenolic Foam Boards
Pr_80_77_76_62 Phenolic Foam Insulation

CAWS

H92_776 Thermal Insulation (Architecture)
P10_185

Details also available at **the NBS Source**.

Building Information Modelling (BIM)

Kingspan Insulation's BIM objects can be downloaded in Revit and in IFC formats. For more information please visit **www.kingspaninsulation.co.uk/bim**.

Wind loading

Where the insulation boards may be subject to external wind pressure, wind loadings should be assessed in accordance with BS EN 1991-1-4: 2005 + A1: 2010 (National Annex to Eurocode 1 Actions on Structures. General Actions. Wind Actions) taking into account:

- length / width / height of the building;
- orientation of the building;
- wind speed;
- aspect (i.e. on a hill side); and
- topographical value of the surrounding area.

Lightning protection

Building designers should give consideration to the requirements of BS EN 62305: 2011 (Protection against lightning).

Sitework

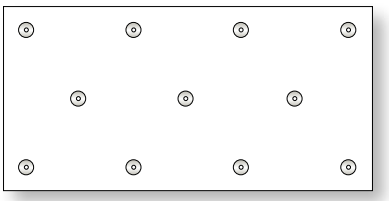
Fixing directly to concrete soffits

- Insulation boards should be installed break-bonded, with joints lightly butted.
- The number of mechanical fixings required to fix Kingspan Kooltherm® K110 PLUS will vary with the geographical location of the building, the local topography, the height and width of the soffit concerned, and the soffit construction.
- A minimum of 11 mechanical fixings, with a minimum head diameter of 25 mm, are required to secure the insulation board to the soffit.
- Where the insulation boards may be subject to external wind pressure, the requirement for additional fixings should be assessed in accordance with BS EN 1991-1-4: 2005 + A1: 2010 (National Annex to Eurocode 1 Actions on Structures. General Actions. Wind Actions).
- The fixings should be evenly distributed over the whole area of the board, and must offer a minimum 40 mm penetration into a solid substrate.
- Please refer to the column opposite for recommended fixing patterns.
- Fixings at board edges must be located > 50 mm and < 150 mm from edges and corners of the board and not overlap board joints.
- For details on fixings refer to:

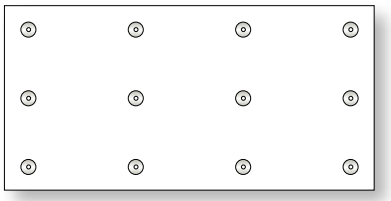
Ejot UK Limited **www.ejot.co.uk**	+44 (0) 1977 687 040
Fixfast **www.fixfast.com**	+44 (0) 1732 882 387
ITW Spit **www.itwcp.co.uk/Spit/**	+44 (0) 800 731 4924
MAK Fasteners **www.makfasteners.com**	+353 (0) 1 451 9004
Masonry Fixings Services Ltd **www.masonryfixings.ie**	+353 (0) 1 642 6700
SFS Intec **www.sfsintec.biz/uk**	+44 (0) 1132 085 500

Recommended fixing patterns

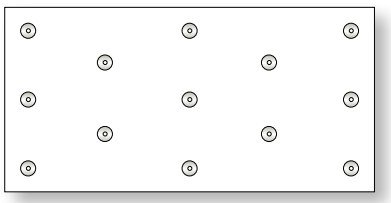
- The images below show recommended fixing patterns, the number of fixings used and the resultant fixing density (number of fixings per m^2).
- The fixing patterns shown are suitable for continuous flat (even) decks only. For non-continuous decks please contact the Kingspan Insulation Technical Service Department (see rear cover) for further guidance.



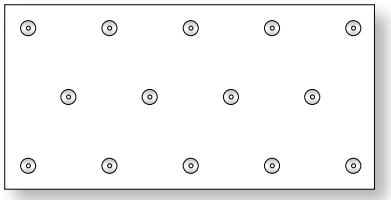
11 No. per board
(2.4 x 1.2 m board - 3.81 fixings / m^2)



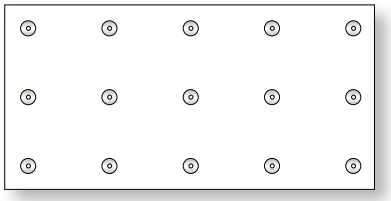
12 No. per board
(2.4 x 1.2 m board - 4.16 fixings / m^2)



13 No. per board
(2.4 x 1.2 m board - 4.51 fixings / m^2)



14 No. per board
(2.4 x 1.2 m board - 4.86 fixings / m^2)



15 No. per board
(2.4 x 1.2 m board - 5.20 fixings / m^2)

Sitework

Taping

- In the absence of other protection, exposed insulation edges of Kingspan Kooltherm® K110 PLUS should be protected by a suitable self-adhesive aluminium foil tape, with a 50 mm min. wide overlap onto the insulation board face (Figure 2).
- For advice on the specification of self-adhesive aluminium foil tape and application guidelines, please refer to:

Bostik Limited +44 (0) 1785 272 727
www.bostik.co.uk

ProTech Global Ltd +44 (0) 117 298 0573
www.protechglobal.co.uk

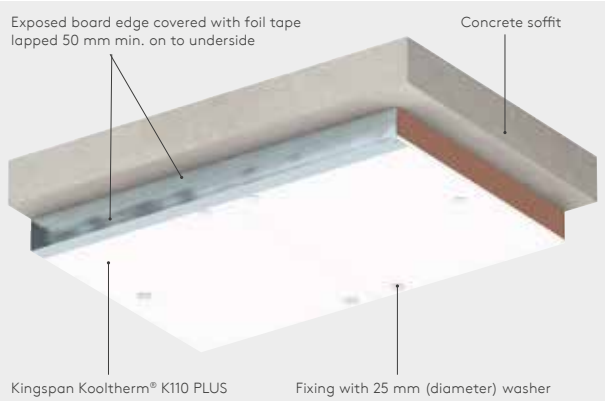


Figure 2: Protection of exposed insulation edges of Kingspan Kooltherm® K110 PLUS

General

Cutting

- The cutting of boards should be carried out by using a fine toothed saw. The snapping of boards is not recommended.
- Ensure accurate trimming to achieve close-butting joints and continuity of insulation.

Availability

- Kingspan Kooltherm® K110 PLUS is available through specialist insulation distributors and selected builders' merchants throughout the UK and Ireland.

Packaging & storage

- The polyethylene packaging of Kingspan Insulation products, which is recyclable, should not be considered adequate for outdoor protection.
- Ideally, boards should be stored inside a building. If, however, outside storage cannot be avoided, then the boards should be stacked clear of the ground and covered with an opaque polythene sheet or weatherproof tarpaulin. Boards that have been allowed to get wet should not be used.

Health & safety

- Kingspan Insulation products are chemically inert and safe to use.
- A Safety Information Data Sheet for this product is available from the Kingspan Insulation website **www.kingspaninsulation.co.uk/safety** or **www.kingspaninsulation.ie/safety**.

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

Product details

The inner facing

The inner (concealed) facing of Kingspan Kooltherm® K110 PLUS is a glass tissue based facing, autohesively bonded to the insulation core during manufacture.

The core

The core of the insulation board component Kingspan Kooltherm® K110 PLUS is a premium performance rigid thermoset fibre-free phenolic insulant manufactured with a blowing agent that has zero Ozone Depletion Potential (ODP) and low Global Warming Potential (GWP).

The outer facing

The outer (exposed) facing of Kingspan Kooltherm® K110 PLUS is a 6 mm A1 Euroclass building board.

Standards & approvals

Kingspan Kooltherm® K110 PLUS is manufactured to the highest standards under a management system certified to ISO 9001: 2015 (Quality Management System), ISO 14001: 2015 (Environmental Management System), IS0 45001: 2018 (Occupational Health & Safety Management System) and ISO 50001: 2018 (Energy Management System).

Standard dimensions

Kingspan Kooltherm® K110 PLUS is available in the following standard size:

Nominal dimension		Availability
Length	(m)	2.4
Width	(m)	1.2
Building Board Thickness	(mm)	6
Insulant Thickness	(mm)	Refer to local distributor or Kingspan Insulation price list for current stock and non-stock sizes.

Compressive strength

The compressive strength of Kingspan Kooltherm® K110 PLUS typically exceeds 100 kPa at 10% compression, when tested to BS EN 826: 2013 (Thermal insulating products for building applications. Determination of compression behaviour).

Water vapour resistance

The insulation component of the product typically achieves a resistance far greater than 41.6 MNs/g, when tested in accordance with BS EN 12086: 2013 (Thermal insulating products for building applications. Determination of water vapour transmission properties).

NB the resistivity of the building board component of the product should be taken as 112 MNs/gm.

Durability

If correctly installed, Kingspan Kooltherm® K110 PLUS can have an indefinite life. Its durability depends on the supporting structure and the conditions of its use.

NB If the building is considered to be in an exposed location advice should be sought from the Kingspan Insulation Technical Service Department to determine the product's suitability.

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 suppliers of the spilt liquid. The insulation core is not resistant to some solvent-based adhesive systems, particularly those containing methyl ethyl ketone. Adhesives containing such solvents should not be used in association with this product. Damaged boards or boards that have been in contact with harsh solvents or acids should not be used.

The insulation core and facings used in the manufacture of Kingspan Kooltherm® K110 PLUS resist attack by mould and microbial growth, and do not provide any food value to vermin.

Product details

Fire performance

There are potential restrictions placed upon this product which vary dependant on building type, height, construction and location. For guidance regarding the routes to compliance for meeting the fire safety requirements of the Building Regulations / Standards, refer to the relevant Technical Bulletins and links to Government websites at **www.kingspaninsulation.co.uk/fireregulations**.

Kingspan Kooltherm® K110 PLUS achieves European Classification (Euroclass) B-s1,d0, when the outer (exposed) 6mm Building board is exposed to the heat source, when classified to EN 13501-1:2018 (Fire classification of construction products and building elements. Classification using data from reaction to fire tests).

Please see the table below for futher test information, conditions and field of application.

Test report number	EUI-21-SBI-000569 EUI-21-SFB-000569 EUI-21-SFB-000207 EUI-21-SBI-000207
Classification report number	EUI-21-000569
Product thickness (mm)	71 - 126
Substrate	Valid with any substrate, except plasterboards, of at least A2-s1,d0 class and at least 652.5 kg/m^3 density
Joints / edges	Valid for all Joint Arrangements

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

Thermal properties

The λ-values and R-values detailed below are quoted in accordance with BS EN 13166: 2012 + A2: 2016 (Thermal insulation products for buildings. Factory made phenolic foam (PF) products. Specification).

Thermal conductivity

The thermal conductivity (λ-value) of the building board component of Kingspan Kooltherm® K110 PLUS is 0.27 W/mK.

The thermal conductivity of the insulation board component of Kingspan Kooltherm® K110 PLUS is 0.019 W/mK.

Thermal resistance

Thermal resistance (R-value) varies with the thickness of each component and is calculated by dividing the thickness of the board (expressed in metres) by its thermal conductivity, followed by adding the resulting figures together. The sum is rounded down to the nearest 0.05 (m^{2}K/W).

Product thickness* (mm)	Thermal resistance (m^{2}K/W)
71	3.40
76	3.65
81	3.90
86	4.20
91	4.45
96	4.70
106	5.25
116	5.75
126	6.30

* Product thickness = insulation thickness + 6 mm building board.

NB Kingspan Insulation's maximum available single insulation thickness is subject to alteration without notice. Please contact the Kingspan Insulation Technical Service Department for current stock and non-stock sizes (see rear cover for details).

About Kingspan Insulation

Company details

Kingspan Insulation Ltd is part of the Kingspan Group plc., one of Europe's leading construction product manufacturers. The Kingspan Group was formed in the late 1960s and is a publicly quoted group of companies headquartered in Kingscourt, County Cavan, Ireland.

Kingspan Insulation Ltd is a market leading manufacturer of premium and high performance rigid insulation products and insulated systems for building fabric and building services applications.

Products & solutions

Optimum, premium and high performance rigid insulation products for building fabric applications, including roofs, walls and floors.

- Kingspan OPTIM-R® - optimum performance vacuum insulation panel (VIP) systems.
- Kingspan Kooltherm® - premium performance phenolic insulation.
- Kingspan Therma™ - high performance PIR insulation.
- K-Roc® - rock mineral fibre insulation.
- Kingspan GreenGuard® - extruded polystyrene insulation (XPS).
- Kingspan TEK® - structural insulated panels (SIPs).
- Cavity closers - PVC-U extrusions with an insulation core.
- Membranes - for pitched roofs and walls.

Services

We are proud to offer one of the most advanced support services in the construction industry, designed to give fast and accurate advice no matter what your role is.
Visit our website to access the following services - **www.kingspaninsulation.co.uk.**

- U-value calculations - free, quick and easy U-value calculations with our U-value Calculator.
- Help and advice on your projects, including stockists, how to guides, regulatory guidance and e-learning.
- Building Information Modelling (BIM) - download BIM objects for our products.
- Tapered roofing service - Kingspan Insulation's tapered roofing systems come with a supporting design service to ensure the most cost-effective solution for a roof is identified.
- CPDs - Kingspan Insulation offer a number of free CPD seminars for architects and specifiers covering a wide range of industry topics. CPDs can be booked or a range of online learning courses can be found online.

Planet Passionate

Planet Passionate is our 10-year group wide global sustainability strategy aims to impact on three big global issues: climate change, circularity and protection of our natural world.

The Planet Passionate strategy is made up of 12 ambitious targets, addressing the impact of Kingspan's business operations and manufacturing on the four key areas of energy, carbon, circularity and water, with commitments by 2030 to include:

- energy: powering 60% of all Kingspan operations directly from renewable energy with a minimum of 20% of this energy generated on manufacturing sites;
- carbon: achieving net zero carbon manufacturing and a 50% reduction in product CO_2 intensity from primary supply partners;
- circularity: upcycling of 1 billion PET bottles per annum into insulation products plus zero company waste to landfill across all sites; and
- water: harvesting 100 million litres of Kingspan's water usage from rainwater.

Contact details

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For individual department contact details please visit
www.kingspaninsulation.ie/contact

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To access pre-existing product information or information relating to previously sold/discontinued products please email literature@kingspaninsulation.co.uk.

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