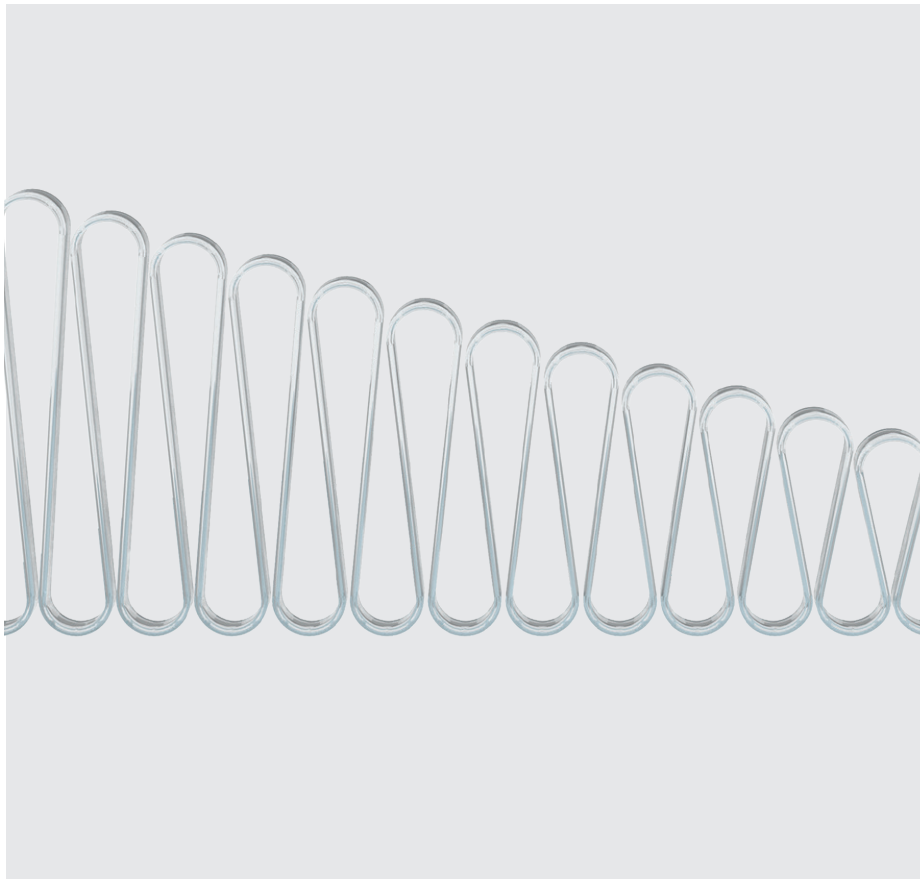


# Tapered Roofing Systems

Tapered insulation to enhance water drainage from flat roofs



- Insulation and drainage in one
- Compatible with most waterproofing and green roof systems
- Provides a practical alternative to screeding, structural falls or firrings
- Load bearing implications for an existing structure can be minimal
- Resistant to the passage of water vapour
- Easy to handle and install compared to some other commonly used insulants
- Ideal for new build and refurbishment
- Tapered insulation U-values calculated according to Annex E of BS EN ISO 6946: 2017

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# Introduction to Kingspan's tapered roofing systems

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## The problem

There are many critical factors which must be taken into consideration when designing a flat roof construction. Two of these factors; insulation and water run-off, can be addressed with one product type: tapered roofing systems.

Many flat roof failures can be traced to the inability of the roof to shed rainwater from its surface, leading to the formation of water ponds. Standing water can:

- cause progressive deflection;
- contribute to thermal stress on the waterproofing;
- create slip hazards caused by algae and mould growth;
- increase water ingress following mechanical damage;
- create a poor aesthetic appearance;
- increase maintenance costs; and
- create odour / hygiene issues.

The most effective remedy is to eliminate ponding by designing an adequate fall into the roof.

## The solution

Kingspan's tapered roofing systems have been developed to help solve these problems and comprise:

- tapered insulation boards;
- flat packer boards;
- pre-mitred hip and valley boards;
- pre-bonded insulation boards;
- pre-bonded pre-mitred hip and valley boards; and
- the market's leading tapered roofing design service.

Kingspan's tapered roofing systems are available in a variety of board types to suit a wide range of roof waterproofing solutions.

Kingspan Insulation has over 20 years of experience providing tapered insulation systems and advice to the construction industry.



Figure 1: Ponding on a typical flat roof

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# The benefits of Kingspan's tapered roofing systems

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## Simpler

On new roofs, the use of one of Kingspan's tapered roofing systems eliminates the need to incorporate a fall into the design of a roof deck. On existing roofs, one of Kingspan's tapered roofing systems and new waterproofing membrane can be laid on top of the original waterproofing. This eliminates the need for stripping down the roof to deck level, and the provision of a vapour control layer may not be required.

NB The existing insulation / substrate and waterproofing must be sound, in order to provide a satisfactory surface for Kingspan's tapered roofing system, and the risk of interstitial condensation must be fully assessed.



Figure 2: Kingspan Insulation's tapered roofing boards

## Less waste

A number of Kingspan's tapered roofing systems are available single picked, pre-mitred and pre-bonded to reduce on site waste.

### Single picked

Boards are typically delivered in exact quantities (as opposed to pack quantities) significantly reducing on site wastage from excess boards.

### Pre-mitred

Pre-mitred boards reduce waste from the installation process. Insulation boards are cut in half by Kingspan Insulation in its factory to make mitred hip and valley boards. For some tapered systems, these are "single picked" to match the tapered system design so as to reduce waste from cutting hips and valleys on site. Both (hip and valley) halves of the cut board are used and the only waste is the dust generated by sawing. Whereas, when boards are cut on site, up to 50% of the cut boards could be wasted, depending on the particulars of the specific board layout and falls design.

### Pre-bonded

Pre-bonded boards remove the need for on site adhesives, proving a more effective adhesive bond whilst reducing wastage, costs and installation time. Factory made hips and valleys are adhesively bonded to the required packer boards by Kingspan Insulation in its factory.

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## Site survey (pre-installation)

Once a scheme has been designed and ordered a pre-installation site survey is available to ensure that the roof deck dimensions are still as originally designed. This enables the scheme to be adapted to fit any changes that may have occurred during the build process. The resulting installation time is quicker as on-site changes will not have to be made, nor will extra boards have to be ordered.

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## Delivery service

Kingspan's tapered roofing systems are stocked items, therefore once an order is placed for a scheme the lead time is very short.

# Design services

## Efficiency by design

Kingspan's tapered roofing systems come with a supporting design service. This ensures that the most cost-effective solution for a roof is identified and that the end result is a tapered system design which meets the roof's rainwater run-off and insulation requirements.

## Board layout & falls design

The design of the board layout and falls of a successful tapered roofing system must take several factors into account:

- the position of the roof outlets;
- the extent of water run-off required;
- the dimensions of the roof;
- the presence of any existing falls or steps on the roof; and
- the location and dimensions of permanent projections such as roof lights, vents etc., and perimeter restrictions.

Normally, for new roofs, this information can be most simply acquired from an architect's drawing. On existing roofs, a free survey of the roof will be carried out by one of our experienced surveyors to collect the required information.

Kingspan's tapered roofing systems are flexible enough to be used for any design requiring a fall to perimeter gutters, valley gutters, or to any other outlet or location. Existing structures on the roof such as roof lighting or equipment can easily be accommodated into the design. The examples in the figures shown on this page illustrate the easily adaptable design of the system.

The board layout and falls of even the most complex tapered system can be designed quickly and effectively, ready for client approval. The design will illustrate the required direction of drainage and will also take into account U-value requirements, condensation risk and minimum / maximum rise restrictions. Client amendments or revisions can be easily incorporated. This service operates under a quality control system certified to ISO 9001: 2015 (Quality Management Systems).

Once the final design has been accepted by the client and one of Kingspan's tapered roofing systems is ordered, a working drawing will be produced on waterproof paper. This drawing will clearly set out the fall pitch, fall direction and fixing of each board type, and will clearly match the markings on the boards. Installation of Kingspan's tapered roofing systems is simple using these easy to follow drawings and, to facilitate installation, each board type is packed separately in labelled shrink wrapped packs.

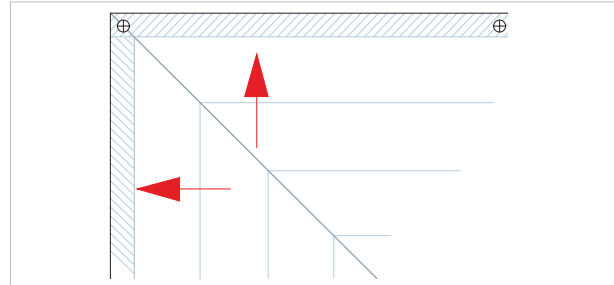


Figure 3: Falls to flat gutters

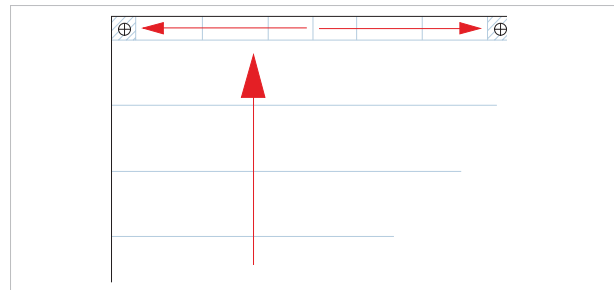


Figure 4: Straight falls to tapered gutter

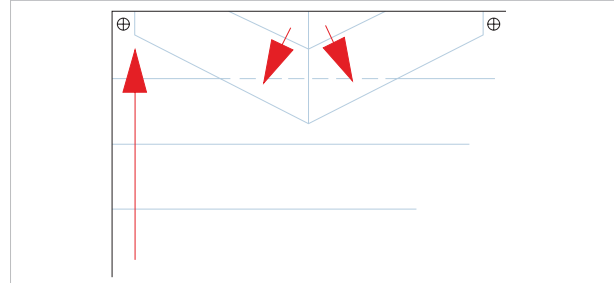


Figure 5: Crickets

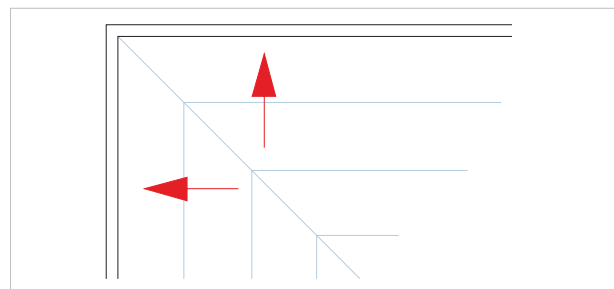


Figure 6: Falls to external gutter / perimeter

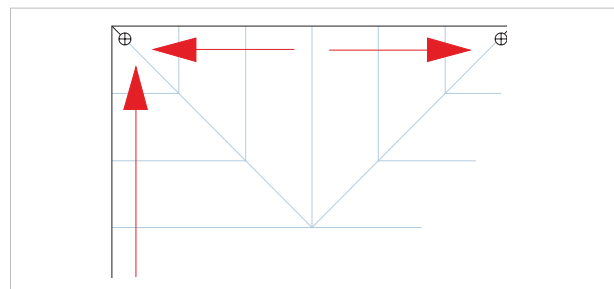


Figure 7: Mitred to outlets

# Design services

## Condensation risk analysis

Included in the design service is the calculation of condensation risk in accordance with BS 5250: 2021 (Code of practice for control of condensation in buildings). This ensures that any predicted dew point is above the vapour control layer at the point of minimum thickness of the tapered roofing system, whilst also ensuring any condensation risk is within the limits given in BS 5250: 2021.

## Calculation of U-values

Kingspan's tapered roofing systems can easily meet the U-values required for compliance with Building Regulations / Standards.

A detailed U-value calculation together with condensation risk analysis should be completed for each individual project.

To submit a U-value request visit [www.kingspaninsulation.co.uk/uvalue](http://www.kingspaninsulation.co.uk/uvalue).

U-values for Kingspan's tapered roofing systems are calculated in accordance with Annex E of BS EN ISO 6946: 2017 (Building components and building elements - Thermal resistance and thermal transmittance - Calculation methods).

## Typical tapered roofing designs

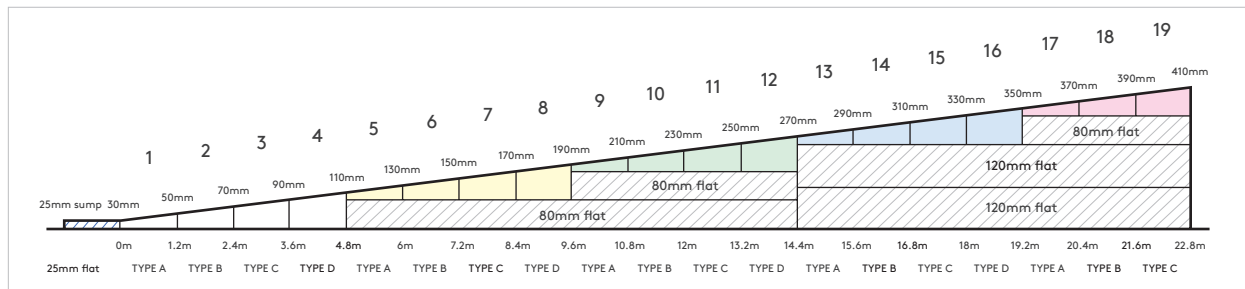


Figure 8: Section 1:60 (Kingspan ThermoTaper® TT44 & TT46)

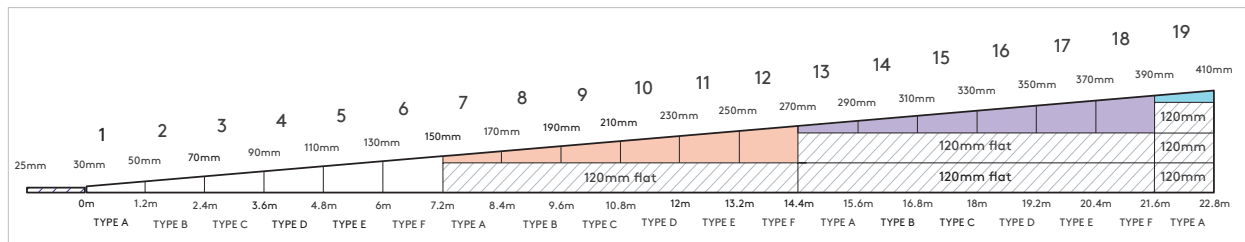


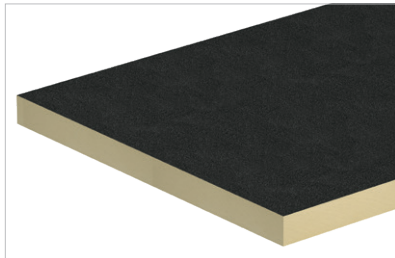
Figure 9: Section 1:60 (Kingspan ThermoTaper® TT47-K)



# Product selector

	Kingspan Thermataper® TT44	Kingspan Thermataper® TT44-K	Kingspan Thermataper® TT46	Kingspan Thermataper® TT47	Kingspan Thermataper® TT47-K	Kingspan Thermataper® TT47-O
Under partially bonded 3 layer built-up felt				✓	✓	✓
Under cold liquid applied waterproofing				✓	✓	✓
Under mastic asphalt				✓	✓	✓
Under partially-bonded torch-on felt waterproofing	✓	✓				
Under mechanical fixed, single-ply non-bituminous membranes			✓	✓		
Under adhered single-ply membranes				✓	✓	✓
In FM approved constructions*			✓	✓		
Suitable for use under Green Roofs	✓	✓	✓	✓	✓	✓

\* Refer to the full product literature for conditions of approval.



## Kingspan Thermataper® TT44

Kingspan Thermataper® TT44 comprises rigid thermoset polyisocyanurate insulation with an upper facing of bitumen coated glass tissue with a thermofusible polypropylene fleece and a mineralised glass tissue lower facing, which can be mechanically fixed over metal, timber, concrete and existing flat roof systems, waterproofed with partially bonded torch applied multi-layer bituminous waterproofing.



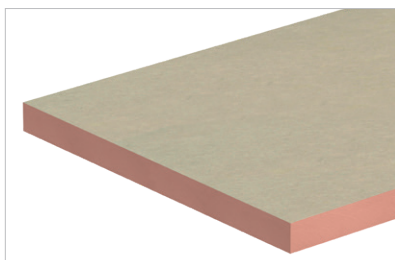
## Kingspan Thermataper® TT46

Kingspan Thermataper® TT46 comprises rigid thermoset polyisocyanurate insulation faced on both sides with a low emissivity composite foil facing, which can be mechanically fixed to new and existing roofs with timber, metal or concrete decks waterproofed with a mechanically fixed single-ply waterproofing.



## Kingspan Thermataper® TT47

Kingspan Thermataper® TT47 comprises rigid thermoset polyisocyanurate insulation faced on both sides with a coated glass tissue, which can be bonded\*\* to new and existing roofs with timber, metal or concrete decks waterproofed with full adhered single-ply, partially bonded built-up felt, mastic asphalt and cold liquid applied waterproofing.



## Kingspan Thermataper® TT44-K\* & Kingspan Thermataper® TT47-K\*

Kingspan Thermataper® TT44-K and TT47-K combines the tapered insulation of either Kingspan Thermataper® TT44 or Kingspan Thermataper® TT47 with a Kingspan Kooltherm® packer board, providing a slim solution for use on new and existing roofs with timber or concrete decks.



## Kingspan Thermataper® TT47-O\*

Kingspan Thermataper® TT47-O combines the tapered insulation of Kingspan Thermataper® TT47 with Kingspan OPTIM-R® vacuum insulation panel (VIP), for use on new and existing roofs with timber, metal or concrete decks, waterproofed with a fully adhered single-ply, partially bonded built-up felt, mastic asphalt or cold liquid applied waterproofing.

\* With a Kingspan Thermataper® overlay.

\*\* Can also be mechanically fixed.

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# Case study

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## Dixon Hotel

The Tower Bridge Magistrates' Court and adjoining police station has been transformed into a luxury 193-bedroom hotel complete with a bar, restaurant, two meeting spaces and gym. Dubbed "The Dixon" in reference to the original architect John Dixon Butler, the hotel forms part of Marriott's Autograph Collection, with the interior design blending influences from the building's Edwardian past with more modern stylings.

Consarc Design Group led the architectural restoration work with Dexter Moren Associates overseeing the planning stage design including the construction of a new build extension. The completed hotel is expected to achieve a 'Very Good' rating under the BREEAM 2014 New Construction

Non-Domestic Building standard, with the new extension designed to achieve the 40% improvement in ADL2A criterion required by the London Plan. To raise the thermal performance of the building's flat roof, whilst also providing effective drainage, Kingspan Thermataper® TT47 and Kingspan Thermaroof® TR27 were installed.

Kingspan Thermataper® TT47 provided the project team with a fast-track alternative to other drainage methods. Kingspan Thermataper® TT47 combines high performance insulation and drainage in a single board which can be fixed with a dry installation process, avoiding the time lost waiting for wet trades to dry.



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# Case study

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## V&A Dundee

Sitting on the banks of the River Tay, the angular form of V&A Dundee immediately demands attention. KENGO KUMA & ASSOCIATES' concrete-faced design draws inspiration from the dramatic cliffs of East Scotland and sets the tone for the visitor experience. Inside, carefully curated permanent galleries explore the past and future of Scottish design, while world class exhibitions will explore a wide range of subjects.

The building also celebrates the best in energy efficient design, utilising air source heat pumps in combination with geothermal energy from thirty, 200-metre deep bore holes to heat and cool the building. To maximise the fabric performance of the external building envelope, a number of Kingspan Insulation products were installed on the floor and roof of the building.

Over 6,500 m<sup>2</sup> of Kingspan Thermataper® TT46 was specified. The product, installed under a roof membrane, provided excellent thermal performance and the required structural fall within a single, lightweight board. Its use, in combination with a further 1,000 m<sup>2</sup> of Kingspan Thermaroof® TR26, allowed for a fast-track installation across the museum roof.

As part of the project's commitment to achieve a BREEAM 'Excellent' Rating, considerable care was taken to ensure the materials specified met the highest standards in responsible sourcing. The insulated boards, manufactured at its facilities in Herefordshire and North Yorkshire, are certified as 'Very Good' under the demanding BES 6001 Responsible Sourcing Standard. As a result, they will contribute toward the award of credits within the Materials section of the building's BREEAM assessment.



Image: Hufton & Crow



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# Case study

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## Weymouth Community Fire Station

Weymouth Community Fire Station is the first purpose built community fire station in the UK and replaces the town's outdated coast-front fire station.

The community station supplies Weymouth with first class fire response and a range of community facilities. These include a large café, several meeting rooms, an IT suite, gym and even a purpose built dance studio with sprung floors.

277 m<sup>2</sup> of Kingspan Thermataper® TT47 was fitted on the flat roof above the station's large main entrance. The system's tapered design allows it to provide flat roofs with both insulation and drainage without the need for a structural fall or screed.

Along with the statement made by its wave-form roof, the design of Weymouth Community Fire Station also reflects the desire to encourage local interaction; with a largely glazed front exterior displaying the fire engines and other internal machinery. The station also features a specialist fire education training facility dubbed "FireWise". This interactive experience takes visitors through the different stages of a fire including a walkthrough house, a "real-life" fire demonstration and the aftermath of fire.



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# Contact details

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[www.kingspaninsulation.co.uk/contact](http://www.kingspaninsulation.co.uk/contact)



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