



**EVENTH FRAMEWORK PROGRAMME
THEME 4
FP7-2010-NMP-ENV-ENERGY-ICT-EeB**



Project no.: 260086

Deliverable Report

Submission Date: Month 42 Nov 2013

D7.4 – Installation guidelines for VIPs

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Kingspan

Project co-funded by the European Commission within the Seventh Framework Programme		
Dissemination level		
PU	Public	X
PP	Restricted to other programme participants (including Commission Services)	
RE	Restricted to a group specific by the consortium (including Commission Services)	
CO	Confidential, only for members of the consortium (including Commission Services)	

1 Document Control

Version	Change Made	Reason For Change	Date of Change	Change By
0.1	First issue		09-09-13	KIL

2 Executive Summary

This report outlines the requirements needed to install opaque vacuum insulation panels for various construction applications.

Application areas covered are flooring, roofing and walling with various sub systems within.

Kingspan have prepared detailed technical literature for the use of their vacuum insulation branded as OPTIM-R in the applications mentioned. The installation element of this literature forms the main body of the report and the full documents are attached as appendices for reference.

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4 Applications released

4.1 Roof Applications

4.1.1 Flat Roofs



Installing Over Concrete Decks

- Concrete decks should be clean, dry, without projections (including fixing heads etc.), steps or gaps, and should be graded to allow correct falls to all rainwater outlets.
- In order to ensure an adequate bond between the concrete deck and the vapour control layer, the concrete deck should be suitably primed, in accordance with the primer manufacturer's instructions, prior to the application of the adhesive system, used to bond the vapour control layer to the deck.
- Where one run of the specified vapour control layer laps another, there should be minimum 150 mm side and end overlaps, which should be adequately sealed.
- Turn up the vapour control layer at the edge of the roof to a height appropriate to the specified waterproofing membrane.
- An optional protection layer may be used under the vacuum insulation panels. For further information please contact the vacuum insulation panel manufacturer.
- The vacuum insulation panels should be laid chessboard pattern where practical, with joints lightly butted. There should be no gaps at abutments.
- Where runs of the vacuum insulation panels do not accurately fit the dimension of the roof, the use of infill panels are required to make up this difference. Each infill panel is to be the same thickness as the vacuum insulation panels.
- Both the vacuum insulation panels and the infill panels should be bonded down using an appropriate proprietary adhesive system.
- At the perimeter of the roof and where upstands or any other penetrations (e.g. roof-lights or ventilator kerbs) are present, infill panels should be laid abutting these areas, in strips no less than 200 mm wide, to take account of building tolerances and to provide a zone to allow for peel restraint mechanical fixing of the membrane should it be required. Refer to the waterproofing manufacturer for guidance on appropriate peel restraint detailing.

- An insulation overlay, such as Kingspan Thermaroom® TR27 LPC/FM, should be laid as soon as possible to avoid exposure of the vacuum insulated panels to direct foot traffic.
- The overlay should be bonded to the upper surface of the vacuum insulated panels using an appropriate proprietary adhesive system prior to the application of the waterproof covering.
- Subject to project requirements, a minimum 25mm thick insulation upstand, such as Kingspan Thermaroom® TR27 LPC/FM, should be used around the perimeter of the roof on the internal façade of parapets.
- A minimum distance of 300 mm should be maintained between the top of the insulation upstand and the bottom of the horizontal roof insulation.
- The waterproofing membrane is installed in accordance with the membrane manufacturer's instructions, over the whole insulated area including any insulation upstands, as soon as possible after laying the insulation boards.

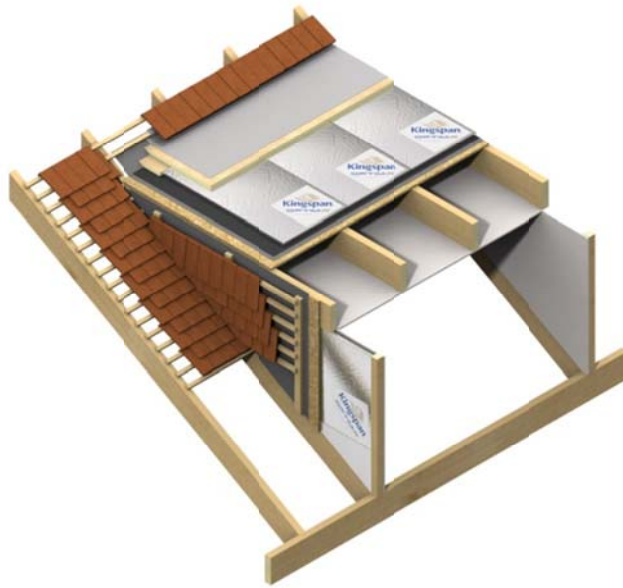
Installing Over Plywood Decks

- Plywood decks should be clean, dry, without projections (including fixing heads etc.), steps or gaps, and should be graded to allow correct falls to all rainwater outlets.
- In order to ensure an adequate bond between the plywood deck and the vapour control layer, the plywood deck should be suitably primed, in accordance with the primer manufacturer's instructions, prior to the application of the adhesive system, used to bond the vapour control layer to the deck.
- Where one run of the specified vapour control layer laps another, there should be minimum 150 mm side and end overlaps, which should be adequately sealed.
- Turn up the vapour control layer at the edge of the roof to a height appropriate to the specified waterproofing membrane.
- An optional protection layer may be used under the vacuum insulation panels. For further information please contact the vacuum insulation panel manufacturer.
- The vacuum insulation panels should be laid chessboard pattern where practical, with joints lightly butted. There should be no gaps at abutments.
- Where runs of the vacuum insulation panels do not accurately fit the dimension of the roof, the use of infill panels are required to make up this difference. Each infill panel is to be the same thickness as the vacuum insulation panels.
- Both the vacuum insulation panels and the infill panels should be bonded down using an appropriate proprietary adhesive system.
- At the perimeter of the roof and where upstands or any other penetrations (e.g. roof-lights or ventilator kerbs) are present, infill panels should be laid abutting these areas, in strips no less than 200 mm wide, to take account of building tolerances and to provide a zone to allow for peel restraint mechanical fixing of the membrane should it be required. Refer to the waterproofing manufacturer for guidance on appropriate peel restraint detailing.
- An insulation overlay, such as Kingspan Thermaroom® TR27 LPC/FM, should be laid as soon as possible to avoid exposure of the vacuum insulation panels to direct foot traffic.
- The overlay should be bonded to the upper surface of the vacuum insulation panels using an appropriate proprietary adhesive system prior to the application of the waterproof covering.
- Subject to project requirements, a minimum 25mm thick insulation upstand, such as Kingspan Thermaroom® TR27 LPC/FM, should be used around the perimeter of the roof on the internal façade of parapets.
- A minimum distance of 300 mm should be maintained between the top of the insulation upstand and the bottom of the horizontal roof insulation.
- The waterproofing membrane is installed in accordance with the membrane manufacturer's instructions, over the whole insulated area including any insulation upstands, as soon as possible after laying the insulation boards.

Installing over Metal Decks, Existing Flat Roofs and Existing Composite Roof Panels

- Vacuum insulation panels are suitable for use over metal decks, existing flat roofs and existing composite roof panels. For further information please contact the vacuum insulation panel manufacturer.

4.1.2 Dormers



Installing over Plywood Decks

- Plywood decks should be clean, dry, without projections (including fixing heads etc.), steps or gaps, and should be graded to allow correct falls to all rainwater outlets.
- In order to ensure an adequate bond between the plywood deck and the vapour control layer, the plywood deck should be suitably primed, in accordance with the primer manufacturer's instructions, prior to the application of the adhesive system, used to bond the vapour control layer to the deck.
- Where one run of the specified vapour control layer laps another, there should be minimum 150 mm side and end overlaps, which should be adequately sealed.
- Turn up the vapour control layer at the edge of the dormer roof to a height appropriate to the specified waterproofing membrane.
- An optional protection layer may be used under the vacuum insulation panels. For further information please contact the vacuum insulation panel manufacturer.
- The vacuum insulation panels should be laid chessboard pattern where practical, with joints lightly butted. There should be no gaps at abutments.
- Where runs of the vacuum insulation panels do not accurately fit the dimension of the dormer roof, the use of infill panels is required to make up this difference. Each infill panel is to be the same thickness as the vacuum insulation panels.
- Both the vacuum insulation panels and the infill panels should be bonded down using an appropriate proprietary adhesive system.
- At the perimeter of the dormer roof or where any other penetrations are present, infill panels should be laid abutting these areas, in strips no less than 200 mm wide, to take account of building tolerances and to provide a zone to allow for peel restraint mechanical fixing of the membrane should it be required. Refer to the waterproofing manufacturer for guidance on appropriate peel restraint detailing.
- An insulation overlay, such as Kingspan Thermaroom® TR27 LPC/FM, should be laid as soon as possible to avoid exposure of the vacuum insulation panels to direct foot traffic.
- The overlay should be bonded to the upper surface of the vacuum insulation panels and infill panels using an appropriate proprietary adhesive system prior to the application of the waterproof covering.

- The waterproofing membrane is installed in accordance with the membrane manufacturer's instructions, over the whole insulated area including any insulation upstands, as soon as possible after laying the insulation boards.

Installing over Existing Flat Roofs

- Vacuum insulation panels are suitable for use over existing flat roofs. For further information please contact the vacuum insulation panel manufacturer.

4.1.3 Balcony and Terrace system



Installing over Concrete Decks

- Concrete decks should be clean, dry, without projections (including fixing heads etc.), steps or gaps, and should be graded to allow correct falls to all rainwater outlets.
- In order to ensure an adequate bond between the concrete deck and the vapour control layer, the concrete deck should be suitably primed, in accordance with the primer manufacturer's instructions, prior to the application of the adhesive system, used to bond the vapour control layer to the deck.
- Where one run of the specified vapour control layer laps another, there should be minimum 150 mm side and end overlaps, which should be adequately sealed.
- Turn up the vapour control layer at the edge of the roof to a height appropriate to the specified waterproofing membrane.
- An optional protection layer may be used under the vacuum insulation panels. For further information please contact the vacuum insulation panel manufacturer.
- The vacuum insulation panels should be laid chessboard pattern where practical, with joints lightly butted. There should be no gaps at abutments.
- Where runs of the vacuum insulation panels do not accurately fit the dimension of the balcony or terrace, the use of infill panels is required to make up this difference. Each infill panel is to be the same thickness as the vacuum insulation panels.
- Where runs of the vacuum insulation panels do not accurately fit the dimension of the balcony or terrace, the use of infill panels is required to make up this difference. Each infill panel is to be the same thickness as the vacuum insulation panels.
- Both the vacuum insulation panels and infill panels should be bonded down using an appropriate proprietary adhesive system. For a loose laid ballasted system please contact the vacuum insulation panel manufacturer.
- At the perimeter of the balcony or terrace and where upstands or any other penetrations (e.g. drainage outlets) are present, infill panels should be laid abutting these areas, in strips no less than 200 mm wide, to take account of building tolerances and to provide a zone to allow for peel restraint mechanical fixing of the membrane should it be required. Refer to the waterproofing manufacturer for guidance on appropriate peel restraint detailing.

- An overlay, such as Kingspan Thermarroof® TR27 LPC/FM or Kingspan Styrozone®, should be laid as soon as possible to avoid exposure of the vacuum insulation panels to direct foot traffic.
- The overlay should be bonded to the upper surface of the vacuum insulation panels and infill panels, using an appropriate proprietary adhesive system prior to the application of the waterproof covering.
- Subject to project requirements, a minimum 25 mm thick insulation upstand, such as Kingspan Thermarroof® TR27 LPC/FM or Kingspan Styrozone®, should be used around the perimeter of the balcony or terrace on the internal façade of parapets.
- Where upstands exist, a minimum distance of 300 mm should be maintained between the top of the insulation upstand and the bottom of the horizontal balcony or terrace insulation.
- The waterproofing membrane is installed in accordance with the membrane manufacturer's instructions, over the whole insulated area including any insulation upstands, as soon as possible after laying the insulation boards.

Installing over Plywood Decks

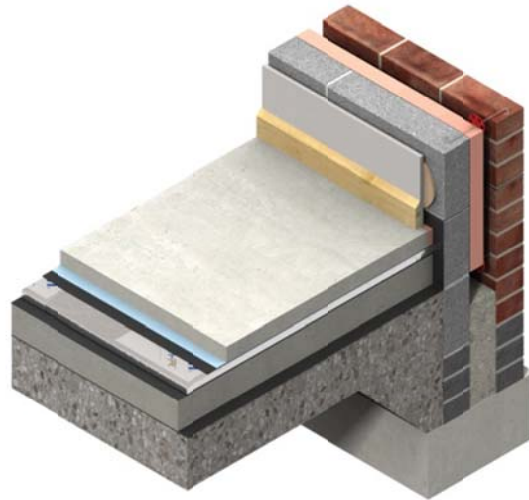
- Plywood decks should be clean, dry, without projections (including fixing heads etc.), steps or gaps, and should be graded to allow correct falls to all rainwater outlets.
- In order to ensure an adequate bond between the plywood deck and the vapour control layer, the plywood deck should be suitably primed, in accordance with the primer manufacturer's instructions, prior to the application of the adhesive system, used to bond the vapour control layer to the deck.
- Where one run of the specified vapour control layer laps another, there should be minimum 150 mm inside and end overlaps, which should be adequately sealed.
- Turn up the vapour control layer at the edge of the balcony or terrace to a height appropriate to the specified waterproofing membrane.
- An optional protection layer may be used under the vacuum insulation panels. For further information please contact the vacuum insulation panel manufacturer.
- The vacuum insulation panels should be laid chessboard pattern where practical, with joints lightly butted. There should be no gaps at abutments.
- Where runs of the vacuum insulation panels do not accurately fit the dimension of the balcony or terrace, the use of infill panels are required to make up this difference. Each infill panel is to be the same thickness as the vacuum insulation panels.
- Both the vacuum insulation panels and the infill panels should be bonded down using an appropriate proprietary adhesive system. For a loose laid ballasted system please contact the vacuum insulation panel manufacturer.
- At the perimeter of the balcony or terrace and where upstands or any other penetrations (e.g. drainage outlets) are present, infill panels should be laid abutting these areas, in strips no less than 200 mm wide, to take account of building tolerances and to provide a zone to allow for peel restraint mechanical fixing of the membrane should it be required. Refer to the waterproofing manufacturer for guidance on appropriate peel restraint detailing.
- An overlay, such as Kingspan Thermarroof® TR27 LPC/FM or Kingspan Styrozone®, should be laid as soon as possible to avoid exposure of the vacuum insulation panels to direct foot traffic.
- The overlay should be bonded to the upper surface of the vacuum insulation panels and the infill panels using an appropriate proprietary adhesive system prior to the application of the waterproof covering.
- Subject to project requirements, a minimum 25 mm thick insulation upstand, such as Kingspan Thermarroof® TR27 LPC/FM or Kingspan Styrozone®, should be used around the perimeter of the balcony or terrace on the internal façade of parapets.
- Where upstands exist, a minimum distance of 300 mm should be maintained between the top of the insulation upstand and the bottom of the horizontal balcony or terrace insulation.

- The waterproofing membrane is installed in accordance with the membrane manufacturer's instructions, over the whole insulated area including any insulation upstands, as soon as possible after laying the insulation boards.

Installing over Existing Flat Roofs

- Vacuum insulation panels are suitable for use over existing flat roofs. For further information please contact the vacuum insulation panel manufacturer.

4.2 Floor applications



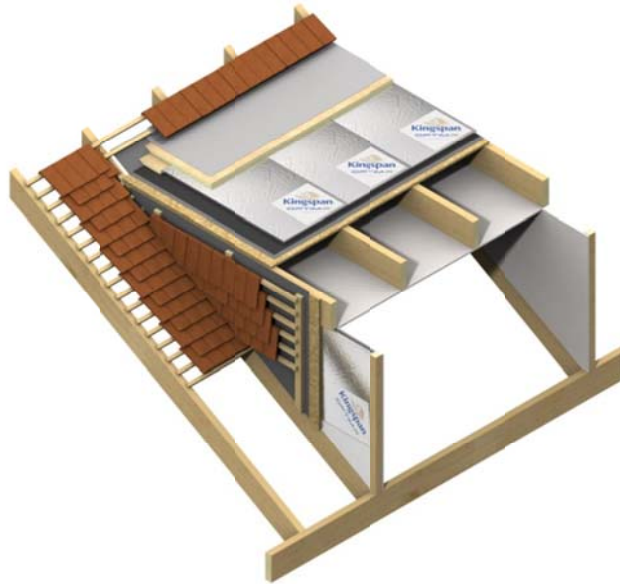
Installation Below a Floor Screed

- Concrete slabs should be allowed to dry out fully prior to the installation of the insulation (average 1 day per mm of slab thickness).
- The surface of the slab should be smooth, flat and free from projections. Thorough cleaning of the floor and removal of all projections is essential. Beam and block floors should be level and grouted.
- If a damp proof membrane (minimum 300 micron / 1200 gauge polythene) is required, it should be laid with joints well lapped and folded, to prevent the passage of ground water, over the concrete slab or beam and block floor prior to laying the vacuum insulation panels.
- The membrane should be brought up the surrounding foundation walls until it is sufficiently above the height of the wall DPC so that it will connect with or form the DPC.
- An optional protection layer may be used under the vacuum insulation panels. For further information please contact the vacuum insulation panel manufacturer.
- The vacuum insulation panels should always be loose-laid, break bonded where practical, with all joints lightly butted.
- Starting at each external corner of the floor proceed to lay the vacuum insulation panels across the floor area in a break bond pattern with all panel joints lightly butted. Where runs of the vacuum insulation panels do not accurately fit the dimension of the floor the use of infill panels is required to make up this difference. It is envisaged that all infill panels against an external wall should be in the centre of the run. Each infill panel is to be the same thickness as the vacuum insulation panels.
- A strip of infill panel (minimum 25mm thickness) should be placed vertically around the perimeter of the floor slab in order to reduce cold bridging. The top of the vertical strip of the infill panel should be level with the top of the floor screed and the bottom should be level with the bottom of the horizontal floor insulation and closely butted up to it.
- An optional protection layer may also be used over the insulation. For further information please contact the vacuum insulation manufacturer.
- Insulation panels (both the vacuum insulation panels and any infill panels used) should be overlaid with a separation layer (not less than 125 micron/500 gauge) to prevent the wet screed penetrating the joints between the boards. Ensure the separation layer has 150mm overlaps, taped at the joints and is turned up 100mm at the walls.

- Use sand and cement screed laid to a minimum thickness of 65mm for domestic constructions and 75mm in all other constructions.

4.3 Wall applications

4.3.1 Dormers

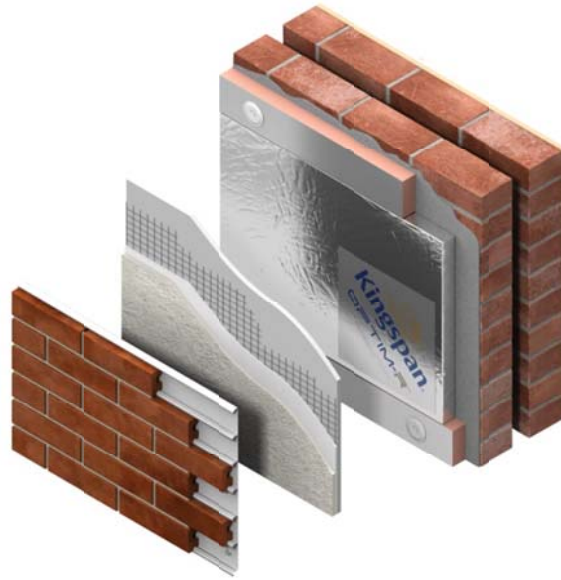


Ventilated Cladding: Timber Frame Wall with Insulation Between Studs

- If the vacuum insulation panels and the infill panels are to be fitted so that they are flush with the outside surface of the timber studs, they must be installed tight up against pre-installed OSB or plywood sheathing.
- Once the vacuum insulation panels and the infill panels are fitted in place, nail treated softwood battens to the side of the studs, to provide a 'stop' to prevent the panels from moving within the stud cavity. Care must be taken to ensure that the vacuum insulation panels are not punctured or damaged in this process.
- When utilising the vacuum insulation panels between studwork with no insulated sheathing, a vapour control layer should be installed. This can be provided by vapour check plasterboard*, Kingspan Kooltherm® K18 Insulated Plasterboard*, the use of a layer of polythene sheeting*, or by the application of two coats of Gyproc Drywall Sealer.
**With appropriate detailing at joints, penetrations and wall perimeters.*
- Ensure there is a tight fit between the vacuum insulation panels and the adjoining studs and other timbers. Where runs of the vacuum insulation panel do not accurately fit the dimension between studwork, the use of infill panels is required to fill any gaps.
- Fill any gaps with an appropriate expanding urethane sealant.
- A breathable membrane, e.g. Kingspan nilvent®, is fitted to the OSB or plywood sheathing / exterior of the insulated frame, and temporarily stapled or pinned in place.
- Preservative treated battens are fixed vertically to the wall structure, through the breathable membrane, ensuring that the battens and fixings are coincident with the underlying timber studs, head rails and sole plates. Care must be taken to ensure fasteners do not penetrate the vacuum insulation panels.
- When selecting the type of fixing and fixing frequency for the battens, consideration must be given to the weight of cladding to be fixed to them, the design of the wall and wind loading.
- If the cladding system is to be tile hung, horizontal tiling battens can then be fixed to the vertical battens, and the tiles fixed to them.
- Alternatively, timber cladding can be fixed directly to the vertical battens.
- If the cladding is to be finished with render, the render carrier (e.g. calcium silicate board, expanded metal lath) can be fixed directly to the vertical battens.

- Insulation advice should be sought from the breathable membrane manufacturer, and the ventilated cladding system should be secured in accordance with the manufacturer's recommendations.

4.3.2 External Masonry walls



Insulated Render Systems

- Because insulated render systems are proprietary and utilise different mechanisms for attaching insulation to the wall structure, sitework guidance should be sought from the render system manufacturer. In the absence of any other guidance, the instructions laid out below may be followed.
- The external masonry wall should be clean, flat, and free from protrusions.
- Where an uneven surface remains, it is recommended that a levelling compound be applied.
- External wall insulation should start 150 / 200 / 600* mm below the top surface of the ground floor insulation / perimeter insulation upstand (whichever is higher) for a concrete floor, or 200 mm below the top surface of the ground floor insulation / perimeter insulation upstand (whichever is higher) for a suspended timber floor.
** 150 mm applies to the UK. 200 mm applies to the Republic of Ireland if a row of insulating blockwork (thermal conductivity < 0.20 W/m.K) is used, otherwise 600 mm applies.*
- Fixing strips, minimum 100 mm wide, should be installed horizontally at maximum 600 mm vertical centres, in order to provide a fixing point for the subsequent attachment of the render carrier board which will accept the render finish or the carrier track which will accept the brick slip system. Fixing strips should be of the same thickness as the specified vacuum insulation panels. Fixing strips should be mechanically fixed back to the substrate using appropriate mechanical fasteners, preferably thermally broken.
- Vacuum insulation panels should be installed between fixing strips with board edges lightly butted. Remaining areas of wall around openings and other details which can not be insulated with the vacuum insulation panels should be in-filled with an equal thickness of infill panel.
- The vacuum insulation panels should be restrained to the substrate using a suitable proprietary adhesive. For further advice on the specification of the proprietary adhesive and application guidance please contact the vacuum insulation panel manufacturer.
- The infill panels should be mechanically fixed back to the substrate using appropriate mechanical fasteners, preferably thermally.
- Care should be taken to install the specified thickness of insulation around reveals.
- Once the vacuum insulation panels, infill panels and fixing strips have been installed, a render carrier board is installed in a continuous layer over the assembly and fixed back to the substrate through the horizontal fixing strips in order to accept the render finish. Alternatively a carrier track can be installed to accept a brick slip finish

- When selecting the type of fixing and fixing frequency, consideration must be given to the weight of the cladding, the design of the wall and wind loading. For details on suitable fixings please consult the appropriate fixing and cladding manufacturer. Care must be taken to ensure fasteners do not penetrate the vacuum insulation panels.
- Wherever possible, care should be taken to avoid cold bridging when attaching services and ancillaries to the exterior of the building.
- Depending on the render finish being applied, advice must be sought from the render manufacturer on the EML / glass fibre mesh and bedding mortar to be applied.
- In refurbishment projects, sill extenders and flashings should be used around openings, with care taken to avoid cold bridging.

Ventilated Cladding Systems

- The external masonry wall should be clean, flat, and free from protrusions. Where an uneven surface remains, it is recommended that a levelling compound be applied.
- External wall insulation should start 150 / 200 / 600* mm below the top surface of the ground floor insulation / perimeter insulation upstand (whichever is higher) for a concrete floor, or 200 mm below the top surface of the ground floor insulation / perimeter insulation upstand (whichever is higher) for a suspended timber floor.
** 150 mm applies to the UK. 200 mm applies to the Republic of Ireland if a row of insulating blockwork (thermal conductivity < 0.20 W/m·K) is used, otherwise 600 mm applies.*
- Fixing strips, minimum 100 mm wide, should be installed vertically at maximum 600 mm horizontal centres, in order to provide a fixing point for the subsequent attachment of the timber battens which will accept the ventilated cladding system. Strips should be of the same thickness as the specified vacuum insulation panels. Fixing strips should be mechanically fixed back to the substrate using appropriate mechanical fasteners, preferably thermally broken.
- The vacuum insulation panels should be installed between the fixing strips with board edges lightly butted. Remaining areas of wall around openings and other details which can not be insulated with the vacuum insulation panels should be in-filled with an equal thickness of infill panel.
- The vacuum insulation panels should be restrained to the substrate using a suitable proprietary adhesive. For further advice on the specification of the proprietary adhesive and application guidance please consult the vacuum insulation panel manufacturer.
- Infill panels should be mechanically fixed back to the substrate, using appropriate mechanical fasteners, preferably thermally broken.
- Care should be taken to install the specified thickness of insulation around reveals.
- Once the vacuum insulation panels, infill panels and fixing strips have been installed, a breathable membrane, e.g. Kingspan nilvent®, is installed over the system and temporarily stapled or pinned in place to the vertical fixing strips.
- Minimum 38 mm x 38 mm vertical treated softwood timber battens are fixed through the breathable membrane and the installed fixing strips vertical to the substrate behind. Care must be taken to ensure fasteners do not penetrate the vacuum insulation panels.
- When selecting the type of fixing and fixing frequency for the vertical battens, consideration must be given to the weight of cladding to be fixed to them, the design of the wall, and wind loading. For details on suitable fixings, please consult the appropriate fixing and cladding manufacturer.
- If the cladding system is to be tile / slate hanging, horizontal tiling battens can then be fixed to the vertical battens.
- Horizontal tiling battens and the tile / slate cladding that is to be fixed to them should be installed in accordance with the tile / slate cladding manufacturers recommendations.
- Alternatively, timber cladding can be fixed directly to the vertical battens.
- If the cladding system is to be finished with render, the render carrier board (e.g. magnesium silicate building board, expanded metal lath) can be fixed directly to the vertical battens.

- The dry cladding system should be secured in accordance with the manufacturer's recommendations.
- Wherever possible, care should be taken to avoid cold bridging when attaching services and ancillaries to the exterior of the building.
- In refurbishment projects, sill extenders and flashings should be used around openings, with care taken to avoid cold bridging.

4.3.3 Rainscreen System



- Because rainscreen cladding systems are proprietary and utilise different mechanisms for attaching cladding panels to the wall structure, installation guidance should be sought from the system manufacturer.
- However, in the absence of any other guidance the instructions laid out below may be followed.
- The substrate against which the vacuum insulation panels are installed should be clean, dry and free from protrusions.
- The vacuum insulation panels should be installed with board edges lightly butted. Remaining areas of wall around brackets, openings, and other details which can not be insulated with the vacuum insulation panels should be in-filled with infill panels. Each infill panel is to be the same thickness as the vacuum insulation panels.
- Infill panels should be cut neatly around fixings and brackets to avoid gaps.
- Vacuum insulation panels should be restrained to the substrate using a suitable proprietary adhesive. For further guidance on the specification of the proprietary adhesive please consult the vacuum insulation panel manufacturer. The infill panels should be restrained using mechanical fixings.
- The adhesive specification, and fixing rate, will potentially vary with the geographical location of the building, the local topography, the height and width of the wall structure, and the type of mechanisms being used to attach the cladding system.
- Infill panels less than 300 mm in width should utilise a single row of insulation fasteners (with a suitable head or washer plate) along the centre line of the strip. Fixings within the row should be evenly distributed along the strip and located at centres no greater than 1200 mm, with a fixing located within 150 mm of each end of the strip. The requirement for additional fixings would need to be assessed on an individual project basis in accordance with BS EN 1991-1-4: 2005 (National annex to Eurocode 1, Actions on structures, General Actions, Wind Actions).
- Mechanical fixings for infill panels should be located greater than 50mm, but less than 150mm from the strip edge.
- Joints of the vacuum insulation panels, and at junctions between the vacuum insulation panels and infill panels should be taped using a minimum 75 mm wide self adhesive aluminium foil rainscreen cladding tape. In the absence of other protection, exposed edges of the vacuum insulation panels should be protected by a self adhesive aluminium foil tape, with a minimum 50 mm wide overlap onto the insulation board face.

- For further guidance on the specification of self adhesive aluminium foil tape and application guidance, please refer to:
Bostik Limited +44 (0) 1785 272 727
www.bostik.co.uk
Venture Tape Europe +44 (0) 1327 876 555
www.venturetape.com

5 Future applications

In existing properties space may already be at a premium and there may be little internal space for installing new internal wall insulation. It may also be difficult to install external wall insulation, for example if the building is in a conservation area, the building owner prefers the existing aesthetic, or where local planning constraints exist. Kingspan Insulation is developing the Kingspan OPTIM-R Internal Wall System which will provide the thinnest possible solution to insulation problems.

As the Building Regulations become more stringent wall cavities may need to become wider. Using the Kingspan OPTIM-R Full Fill System can ensure that cavities remain as thin as possible.

6 Appendix

6.1 OPTIM-R Roofing System literature

6.2 OPTIM-R Dormer System literature

6.3 OPTIM-R Balcony & Terrace System literature

6.4 OPTIM-R Flooring System literature

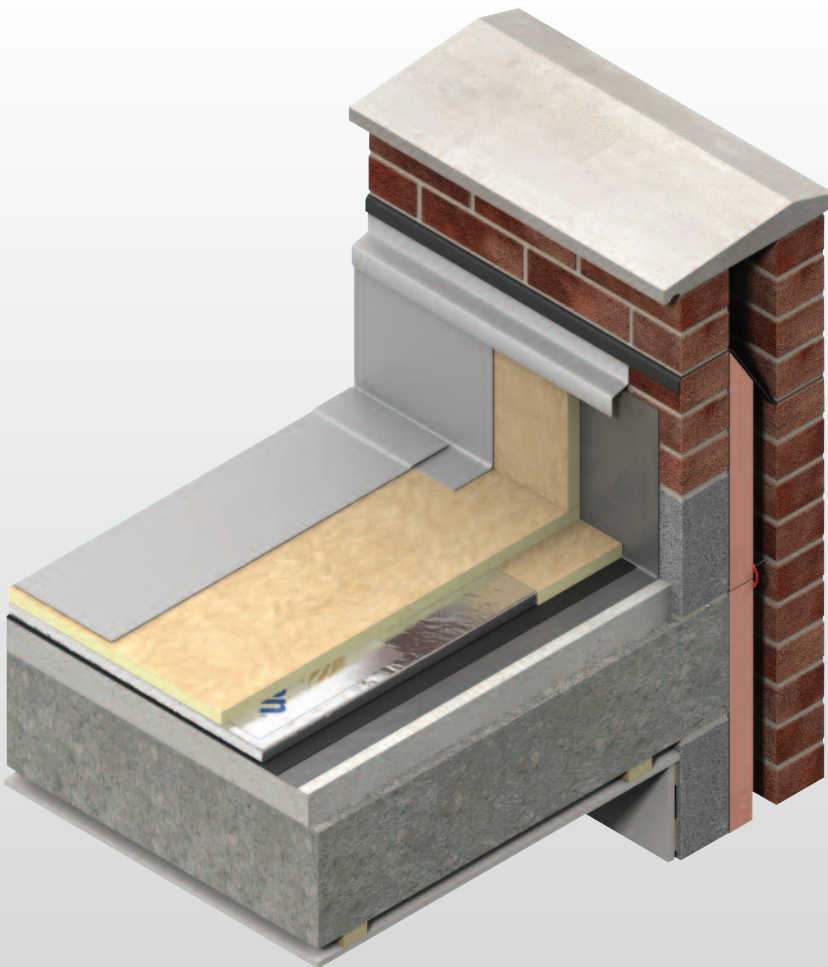
6.5 OPTIM-R External Wall System literature

6.6 OPTIM-R Rainscreen System literature



OPTIM-R™ Roofing System

NEXT GENERATION INSULATION SOLUTION
FOR FLAT ROOFS



- Optimum performance rigid vacuum insulation panel – aged design value thermal conductivity 0.007 W/m-K
- Insulating performance up to five times better than other commonly available insulation materials
- Over 90% (by weight) recyclable
- Resistant to the passage of water vapour
- Ideal for new build and refurbishment
- Non-deleterious material



*Low Energy –
Low Carbon Buildings*

Introduction

The Problem

When constructing a roof in new build situations or replacing a roof in existing buildings there may be a requirement for both low U-values and the thinnest possible roof build-up.

For new-build applications, there are increasing regulatory requirements and economic reasons to improve energy efficiency. One of the approaches is to improve the thermal performance of the building fabric whilst keeping the overall construction as thin as possible. There are already high performance insulation products available that will fulfil the majority of these requirements, however in certain areas, for example where the design demands it, a new, thinner, product is needed.

In refurbishment there is arguably a greater need to keep roof build-ups as thin as possible. In certain applications internal space may be at a premium or there may be little space for installing new roof insulation, for example in buildings with planning height restrictions.

The Solution

The **Kingspan OPTIM-R™ Roofing System** has been developed to help solve these problems. The **Kingspan OPTIM-R™ Roofing System** is an optimum performance next generation insulation solution from Kingspan Insulation. It comprises of rigid vacuum insulation panels with a micro-porous core which is evacuated, encased and sealed in a thin, gas-tight envelope, giving outstanding thermal conductivity, with the thinnest possible solution to insulation problems. The vacuum insulation panels are accompanied with rigid thermoset polyisocyanurate (PIR) insulation infill panels which can be cut to fit around problem areas such as roof lights or ventilator kerbs.

In retrofit applications, the **Kingspan OPTIM-R™ Roofing System** provides solutions for areas that previously would have remained un-insulated because of insufficient space available.

In new constructions, the **Kingspan OPTIM-R™ Roofing System** can significantly enhance U-values in areas that would otherwise be accepted as denigrating the overall thermal performance.

With an aged design value thermal conductivity (λ) of 0.007 W/m·K, the **Kingspan OPTIM-R™** element of the **Roofing System** provides an insulating performance that is up to five times better than other commonly available insulation materials.

The high level of thermal efficiency with minimal thickness, achieved by the **Kingspan OPTIM-R™ Roofing System** provides solutions for applications where a lack of construction depth or space is an issue.

Design Considerations

Design Services

The **Kingspan OPTIM-R™ Roofing System** comes with a supporting design service which ensures the ratio of the **Kingspan OPTIM-R™** element of the Roofing System to the **Kingspan OPTIM-R™ Roofing System** infill panel for each project is maximised. The panel layout will be designed quickly and effectively, ready for client approval. Each layout will illustrate the size, number and location of the **Kingspan OPTIM-R™** panels. It will also illustrate the size, number and location of any **Kingspan OPTIM-R™ Roofing System** infill panels required. Examples of a typical design layout can be seen in Figures 1 & 3.

For more details please contact the Kingspan Insulation Technical Service Department (see rear cover).

Condensation Risk Analysis

Included in the design service is the calculation of condensation risk in accordance with BS 5250: 2002 (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 **Kingspan OPTIM-R™ Roofing System**, whilst also ensuring any condensation risk is within the limits given in BS 5250: 2002.

Assumptions

The U-values in the tables that follow have been calculated, under a management system certified to the BBA Scheme for Assessing the Competency of Persons to Undertake U-value and Condensation Risk Calculations, using the method detailed in BS / I.S. EN ISO 6946: 2007 (Building components and building elements. Thermal resistance and thermal transmittance. Calculation method) and using the conventions set out in BR443 (Conventions for U-value calculations). They are valid for the constructions shown in the details adjacent to each table.

N.B. 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.

N.B. The figures quoted are for guidance only. A detailed U-value calculation together with condensation risk analysis should be completed for each individual project.

N.B. To gain a comprehensive U-value calculation for your project please consult the Kingspan Insulation Technical Service Department for assistance (see rear cover).



Typical Roofing Designs for the *Kingspan OPTIM-R™* Roofing System

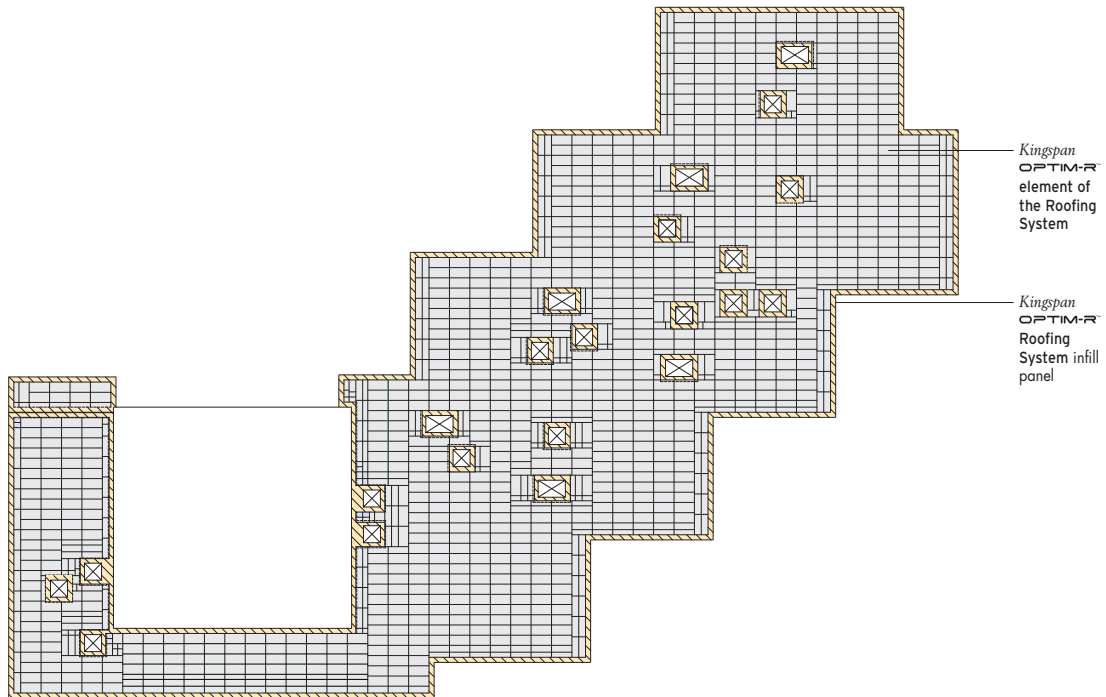


Figure 1

Concrete Deck

Dense Concrete Deck with Suspended Ceiling

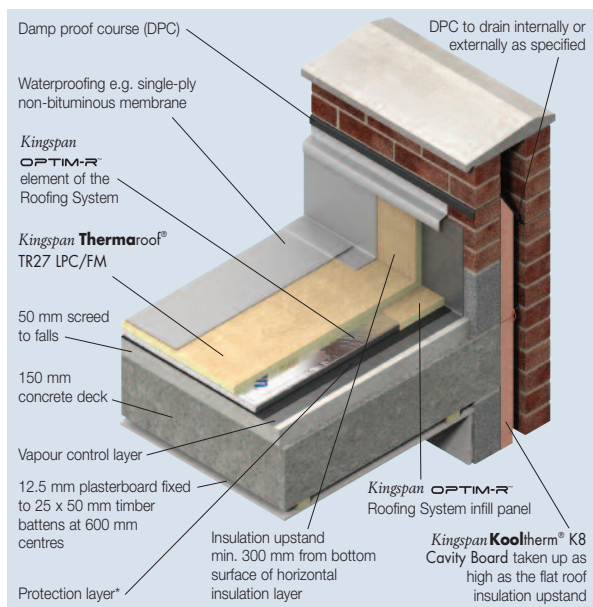


Figure 2

* Refer to Sitework.

The *Kingspan OPTIM-R™* Roofing System, when used in the design in Figure 1 and when installed on top of a dense concrete deck with suspended ceiling (Figure 2), can achieve the following U-values using a combined thickness of both the *Kingspan OPTIM-R™* Roofing System and a *Kingspan Thermo*roof® TR27 LPC/FM overlay:

<i>Kingspan OPTIM-R™</i> Roofing System thickness (mm)	<i>Kingspan Thermo</i> roof® TR27 LPC/FM overlay thickness (mm)	U-values (W/m ² ·K)
40	25	0.16
50	25	0.14
50	30	0.13
30 + 30	25	0.12
40 + 30	25	0.11
40 + 30	30	0.10
40 + 40	25	0.09

* Based on 11% bridging of the *Kingspan OPTIM-R™* Roofing System infill panel.

Design Considerations

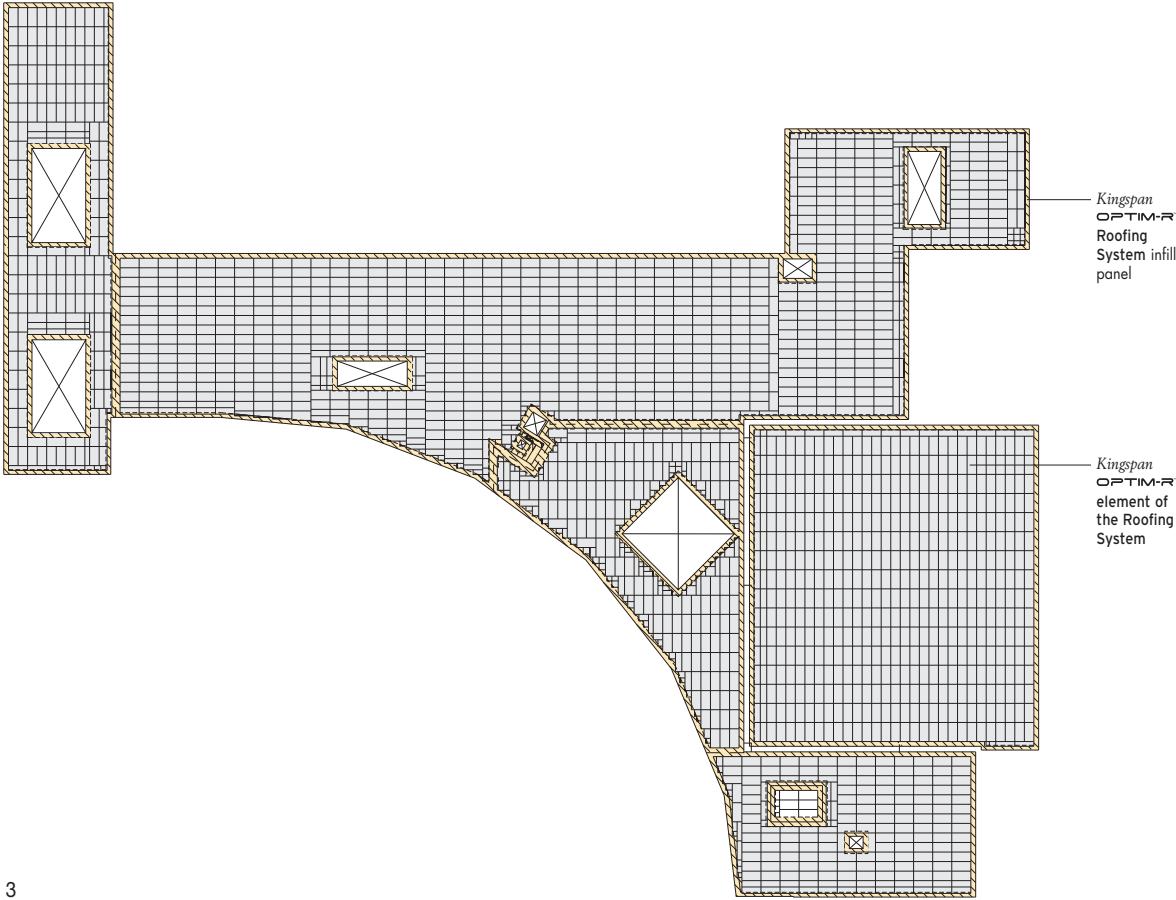


Figure 3

Timber Deck

Timber Deck with Plasterboard Ceiling

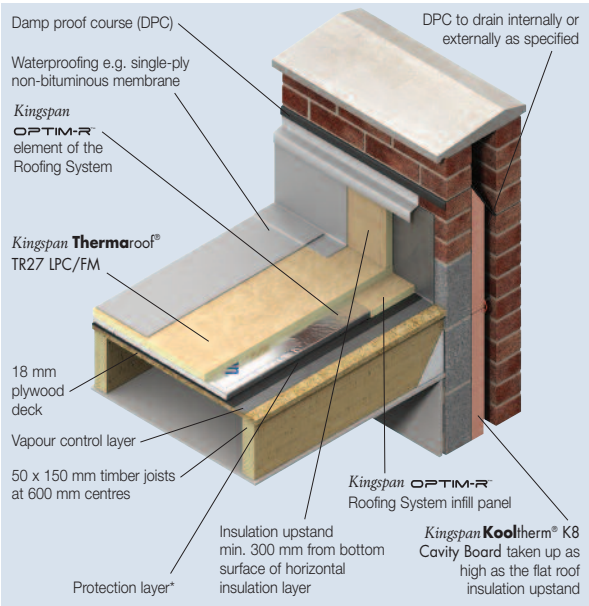


Figure 4

* Refer to Sitework.

The Kingspan OPTIM-R Roofing System, when used in the design in Figure 3 and when used on top of a timber deck with plasterboard ceiling (Figure 4), can achieve the following U-values using a combined thickness of both the Kingspan OPTIM-R Roofing System and a Kingspan Thermaroof TR27 LPC/FM overlay:

Kingspan OPTIM-R Roofing System thickness (mm)	Kingspan Thermaroof TR27 LPC/FM overlay thickness (mm)	U-values (W/m ² ·K)
40	25	0.16
50	25	0.14
50	30	0.13
30 + 30*	25	0.12
40 + 30*	25	0.10
40 + 30*	30	0.10
40 + 40*	25	0.09

* Based on 10.37% bridging of the Kingspan OPTIM-R Roofing System infill panel.

Linear Thermal Bridging

Reasonable provision must be made to limit the effects of cold bridging. The design should ensure that roof-light or ventilator kerbs etc. are insulated with a 25 mm thick *Kingspan Thermaroof*[®] TR27 LPC/FM board. A 25 mm thick *Kingspan Thermaroof*[®] TR27 LPC/FM upstand should also be used around the perimeter of the roof on the internal façade of parapets. A minimum distance of 300 mm should be maintained between the top of the insulation upstand and the bottom of the horizontal roof insulation. Wall insulation should also be carried up into parapets as high as the flat roof insulation upstand.

Please contact the Kingspan Insulation Technical Service Department (see rear cover) for further advice.

Responsible Sourcing

The *Kingspan OPTIM-R*[™] Roofing System is manufactured under a management system certified to ISO 14001: 2004.

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 is available at www.kingspaninsulation.co.uk/sustainabilityandresponsibility.

NBS Specifications

Details also available in NBS Plus.
NBS users should refer to clause(s):
J42 420, J42 430, J31 335
(Standard and Intermediate)
J42 10, J31 10 (Minor Works).



Wind Loading

Wind loadings should be assessed in accordance with BS 6399-2: 1997 (Loadings for buildings. Code of practice for wind loads) or BS / I.S. EN 1991-1-4: 2005 (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 (e.g. on a hill side); and
- topographical value of the surrounding area.

Falls

The fall on a flat roof, constructed using the *Kingspan OPTIM-R*[™] Roofing System, is normally provided by the supporting structure being directed towards the rainwater outlets. The fall should be smooth and steep enough to prevent the formation of rainwater ponds. In order 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 is advisable to design in even greater falls. These can be provided by the *Kingspan OPTIM-R*[™] Roofing System when used with an overlay of *Kingspan Thermataper*[®] TT47 LPC/FM (see below).

Tapered Roofing

The *Kingspan OPTIM-R*[™] Roofing System can also be used in a tapered roofing scheme. The scheme comes 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 a roof's rainwater run-off and insulation requirements. For more details please contact the Kingspan Insulation Tapered Roofing Department (see rear cover), which should be consulted as early as possible in the process of designing a roof.

Green Roofs

The *Kingspan OPTIM-R*[™] Roofing System is suitable for use under most warm green roof systems.

Green roof systems are a specialist design area. When designing a loose-laid insulated green roof assembly consideration needs to be given to the following.

Green roof systems are required to have a minimum dry weight of 80 kg/m² to ballast the insulation boards beneath them. However, the total required dry weight will depend upon wind uplift, which in turn will vary with the geographical location of the building, local topography, and the height and the width of the roof concerned. The necessity for any additional dry weight should be assessed in accordance with BS 6399-2: 1997 (Loading for Buildings. Code of practice for wind loads) or BS / I.S. EN 1991-1-4: 2005 (National Annex to Eurocode 1 Actions on structures. General Actions. Wind Actions).

When installing a loose-laid insulated green roof assembly, any insulation must be immediately over-laid with the green roof system, which must meet all of the requirements outlined above.

Where these requirements cannot be ensured, the insulation must be bonded down (see Sitework). For further information please contact the Kingspan Insulation Technical Service Department (see rear cover).

Typical Constructions

Metal Deck

Metal Deck with No Ceiling

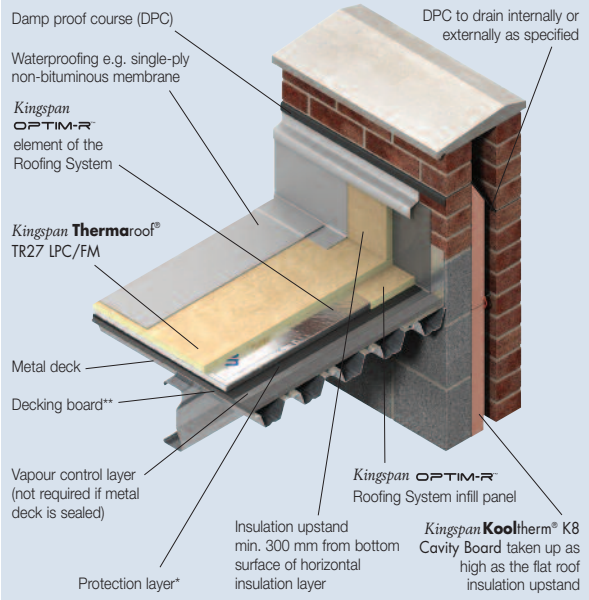


Figure 5

* Refer to Sitework.
 ** Specification and thickness dependent on metal decking specification.

Semi-intensive Green Roof Covering – Dense Concrete Deck with Suspended Ceiling

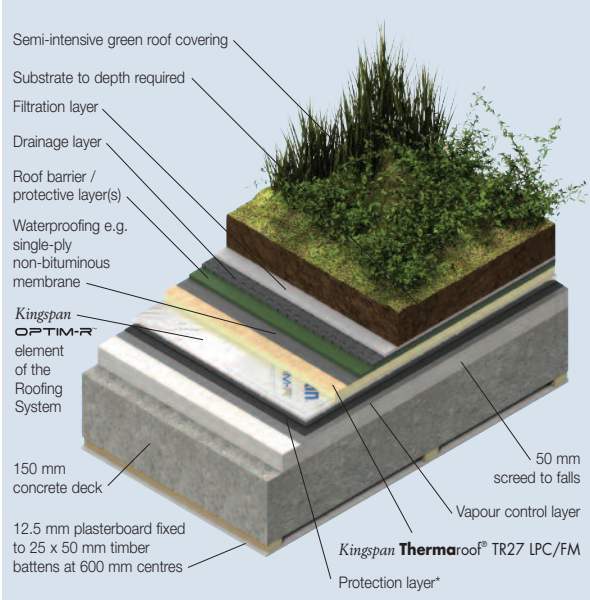


Figure 7

* Refer to Sitework.

Green Roof Systems

Extensive Green Roof Covering – Metal Deck with No Ceiling

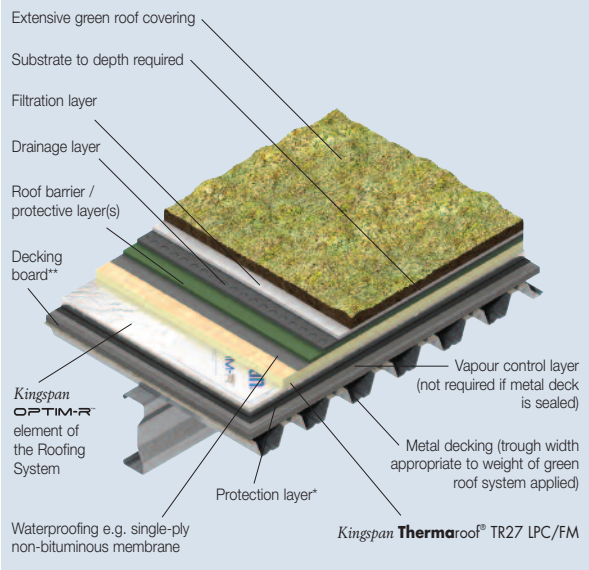


Figure 6

* Refer to Sitework.
 ** Specification and thickness dependent on metal decking specification.

Design Considerations

Roof Waterproofing

The *Kingspan OPTIM-R™ Roofing System*, when used in conjunction with an overlay of *Kingspan Thermo roof® TR27 LPC/FM*, is suitable for use with most fully adhered single-ply waterproofing membranes. When using the *Kingspan OPTIM-R™ Roofing System* with fully adhered single-ply waterproofing membranes, the joints between the *Kingspan Thermo roof® TR27 LPC/FM*, immediately below the waterproofing membrane, can be taped with a min. 50 mm wide foil tape (refer to the appropriate single-ply membrane manufacturer's instructions). Please contact the Kingspan Insulation Technical Service Department (see rear cover) to check waterproofing membrane and proprietary adhesive system compatibility. Advice should be sought, from the appropriate waterproofing membrane manufacturer, in relation to the requirement for the use of a fleece backed membrane with the waterproofing membrane in question.

The *Kingspan OPTIM-R™ Roofing System* is, when used in conjunction with an overlay of *Kingspan Thermo roof® TR27 LPC/FM*, also suitable for use with some cold liquid applied waterproofing systems. When using the *Kingspan OPTIM-R™ Roofing System* with cold liquid applied waterproofing systems, a carrier membrane for the waterproofing must be installed over the *Kingspan Thermo roof® TR27 LPC/FM*. Advice should be sought, from the waterproofing system manufacturer, about the specification of the carrier membrane and the compatibility of the waterproofing system with the *Kingspan OPTIM-R™ Roofing System*. For further advice please contact the Kingspan Insulation Technical Service Department (see rear cover).

Water Vapour Control

The *Kingspan OPTIM-R™ Roofing System* must be installed over a separate vapour control layer. A minimum vapour control layer should consist of a coated roofing felt complying with Type 3B to BS 747: 2000 (Reinforced bitumen sheets for Roofing. Specification), or S1P1 to BS 8747: 2007 (Reinforced bitumen membranes (RBMs) for roofing. Guide to selection and specification). Alternative vapour control layers should be discussed with the Kingspan Insulation Technical Service Department (see rear cover).

Where the separate vapour control layer is to be bonded, allowance should be made for adequate bonding of the vapour control layer to the substrate, so as to provide a suitable surface upon which to lay the insulation panels and sufficient resistance to wind up-lift (see 'Wind Loading').

Sitework

Installing over Concrete Decks

- Concrete decks should be clean, dry, without projections (including fixing heads etc.), steps or gaps, and should be graded to allow correct falls to all rainwater outlets.
- In order to ensure an adequate bond between the concrete deck and the vapour control layer, the concrete deck should be suitably primed, in accordance with the primer manufacturer's instructions, prior to the application of the adhesive system, used to bond the vapour control layer to the deck.
- Where one run of the specified vapour control layer laps another, there should be minimum 150 mm side and end overlaps, which should be adequately sealed.
- Turn up the vapour control layer at the edge of the roof to a height appropriate to the specified waterproofing membrane.
- An optional protection layer may be used under the *Kingspan OPTIM-R™ Roofing System*. For further information please contact the Kingspan Insulation Technical Service Department (see rear cover).
- The *Kingspan OPTIM-R™* element of the Roofing System should be laid chessboard pattern where practical, with joints lightly butted. There should be no gaps at abutments.
- Where runs of the *Kingspan OPTIM-R™* element of the Roofing System do not accurately fit the dimension of the roof, the use of *Kingspan OPTIM-R™ Roofing System* infill boards are required to make up this difference. Each *Kingspan OPTIM-R™ Roofing System* infill panel is to be the same thickness as the *Kingspan OPTIM-R™* element of the Roofing System.
- Both the *Kingspan OPTIM-R™* element of the Roofing System and the *Kingspan OPTIM-R™ Roofing System* infill panels should be bonded down using an appropriate proprietary adhesive system.
- At the perimeter of the roof and where upstands or any other penetrations (e.g. roof-lights or ventilator kerbs) are present, *Kingspan OPTIM-R™ Roofing System* infill panels should be laid abutting these areas, in strips no less than 200 mm wide, to take account of building tolerances and to provide a zone to allow for peel restraint mechanical fixing of the membrane should it be required. Refer to the waterproofing manufacturer for guidance on appropriate peel restraint detailing.
- The *Kingspan Thermaroof® TR27 LPC/FM* infill panels should be laid as soon as possible to avoid exposure of the *Kingspan OPTIM-R™* element of the Roofing System to direct foot traffic.
- The *Kingspan Thermaroof® TR27 LPC/FM* should be bonded to the upper surface of the *Kingspan OPTIM-R™* element of the Roofing System using an appropriate proprietary adhesive system prior to the application of the waterproof covering.
- Subject to project requirements, a minimum 25mm thick *Kingspan Thermaroof® TR27 LPC/FM* upstand should be used around the perimeter of the roof on the internal façade of parapets.
- A minimum distance of 300 mm should be maintained between the top of the insulation upstand and the bottom of the horizontal roof insulation.
- The waterproofing membrane is installed in accordance with the membrane manufacturer's instructions, over the whole insulated area including any insulation upstands, as soon as possible after laying the insulation boards.

Installing over Plywood Decks

- Plywood decks should be clean, dry, without projections (including fixing heads etc.), steps or gaps, and should be graded to allow correct falls to all rainwater outlets.
- In order to ensure an adequate bond between the plywood deck and the vapour control layer, the plywood deck should be suitably primed, in accordance with the primer manufacturer's instructions, prior to the application of the adhesive system, used to bond the vapour control layer to the deck.
- Where one run of the specified vapour control layer laps another, there should be minimum 150 mm side and end overlaps, which should be adequately sealed.
- Turn up the vapour control layer at the edge of the roof to a height appropriate to the specified waterproofing membrane.
- An optional protection layer may be used under the *Kingspan OPTIM-R™ Roofing System*. For further information please contact the Kingspan Insulation Technical Service Department (see rear cover).
- The *Kingspan OPTIM-R™* element of the Roofing System should be laid chessboard pattern where practical, with joints lightly butted. There should be no gaps at abutments.
- Where runs of the *Kingspan OPTIM-R™* element of the Roofing System do not accurately fit the dimension of the roof, the use of *Kingspan OPTIM-R™ Roofing System* infill boards are required to make up this difference. Each *Kingspan OPTIM-R™ Roofing System* infill panel is to be the same thickness as the *Kingspan OPTIM-R™* element of the Roofing System.
- Both the *Kingspan OPTIM-R™* element of the Roofing System and the *Kingspan OPTIM-R™ Roofing System* infill panels should be bonded down using an appropriate proprietary adhesive system.

- At the perimeter of the roof and where upstands or any other penetrations (e.g. roof-lights or ventilator kerbs) are present, *Kingspan OPTIM-R™ Roofing System* infill panels should be laid abutting these areas, in strips no less than 200 mm wide, to take account of building tolerances and to provide a zone to allow for peel restraint mechanical fixing of the membrane should it be required. Refer to the waterproofing manufacturer for guidance on appropriate peel restraint detailing.
- The *Kingspan Thermaroof® TR27 LPC/FM* infill panels should be laid as soon as possible to avoid exposure of the *Kingspan OPTIM-R™* element of the Roofing System to direct foot traffic.
- The *Kingspan Thermaroof® TR27 LPC/FM* should be bonded to the upper surface of the *Kingspan OPTIM-R™* element of the Roofing System using an appropriate proprietary adhesive system prior to the application of the waterproof covering.
- Subject to project requirements, a minimum 25mm thick *Kingspan Thermaroof® TR27 LPC/FM* upstand should be used around the perimeter of the roof on the internal façade of parapets.
- A minimum distance of 300 mm should be maintained between the top of the insulation upstand and the bottom of the horizontal roof insulation.
- The waterproofing membrane is installed in accordance with the membrane manufacturer's instructions, over the whole insulated area including any insulation upstands, as soon as possible after laying the insulation boards.

Installing over Metal Decks, Existing Flat Roofs and Existing Composite Roof Panels

- The *Kingspan OPTIM-R™ Roofing System* is suitable for use over metal decks, existing flat roofs and existing composite roof panels. For further information please contact the Kingspan Insulation Technical Service Department (see rear cover).

Sitework

Wheeled / Foot Traffic

- The *Kingspan OPTIM-R™* element of the Roofing System should not be walked on. A protective foot or crawl board should be used during the installation process.
- The *Kingspan OPTIM-R™ Roofing System* infill panels and the *Kingspan Thermaroof® TR27 LPC/FM* overlay may be walked on.

General

- The *Kingspan OPTIM-R™* element of the Roofing System should not be used in association with solvent-based adhesive systems.
- The *Kingspan OPTIM-R™* element of the Roofing System should not be exposed to naked flames or excessive heat.

Cutting

- The *Kingspan OPTIM-R™* element of the Roofing System should not be cut or penetrated.
- The substrate must be clean, dry and level, and free of sharp objects or edges.
- Cutting of the *Kingspan OPTIM-R™ Roofing System* infill panels should be carried out either by using a fine toothed saw, or by scoring with a sharp knife, snapping the board over a straight edge and then cutting the facing on the other side.
- Ensure accurate trimming of the *Kingspan OPTIM-R™ Roofing System* infill panels to achieve close-butting joints and continuity of insulation.

Availability

- Please contact Kingspan Insulation for availability of the *Kingspan OPTIM-R™ Roofing System*.

Packaging and Storage

- The packaging of the *Kingspan OPTIM-R™ Roofing System* should not be considered adequate for outdoor protection. The *Kingspan OPTIM-R™ Roofing System* should be stored inside a building and raised off the floor.

Health and 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.

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 panel 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.

The reflective facing used on this product can be slippery underfoot when wet. Therefore, it is recommended that any excess material should be contained to avoid a slip hazard.

Product Details

Composition

The *Kingspan OPTIM-R*™ element of the Roofing System comprises a rigid vacuum insulation panel with a microporous core which is evacuated, encased and sealed in a thin, gas-tight envelope.

The *Kingspan OPTIM-R*™ Roofing System infill panels comprise of a high performance rigid thermoset polyisocyanurate (PIR) insulant, faced on both sides with a coated glass tissue.

Standards and Approvals

The *Kingspan OPTIM-R*™ Roofing System is manufactured to the highest standards under a management system certified to ISO 9001: 2008 (Quality Management Systems. Requirements), ISO 14001: 2004 (Environmental Management Systems. Requirements) and OHSAS 18001: 2007 (Health and Safety Management Systems. Requirements).

Standard Dimensions

The *Kingspan OPTIM-R*™ Roofing System panels are available in the following standard size(s):

Nominal Dimension	Availability
Length (mm)	300 – 1200
Width (mm)	300 – 600
Insulant Thickness (mm)	20 – 40

Other sizes may be available dependent on order quantity. Please contact Kingspan Insulation for more details.

Compressive Strength

The compressive strength of the *Kingspan OPTIM-R*™ element of the Roofing System typically exceeds 160 kPa at 10% compression when tested to BS / I.S. EN ISO 826: 1996 (Thermal insulating products for building application. Determination of compression behaviour).

Durability

If installed correctly and protected from damage and penetration, the *Kingspan OPTIM-R*™ Roofing System will provide reliable long-term thermal performance over the lifetime of the building.

Resistance to Solvents, Fungi & Rodents

The *Kingspan OPTIM-R*™ Roofing System should not be used in association with solvent-based adhesive systems. Damaged boards or boards that have been in contact with solvents or acids should not be used.

The insulation core and facings used in the manufacture of the *Kingspan OPTIM-R*™ Roofing System resist attack by mould and microbial growth, and do not provide any food value to vermin.

Fire Performance

The *Kingspan OPTIM-R*™ Roofing System, when subjected to the British Standard fire test, specified in the table below, will achieve the result shown, when waterproofed with a single-ply waterproofing membrane.

Test	Result
BS 476-3: 2004 (External fire exposure roof test)	Dependent on single-ply membrane adopted

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

Thermal Properties of the *Kingspan OPTIM-R*™ element of the Roofing System

The λ -values and R-values detailed below are quoted in accordance with BS / I.S. EN 12667: 2001 (Thermal performance of building materials and products. Determination of thermal resistance by means of guarded hot plate and heat flow meter methods. Products of high and medium thermal resistance), with allowance for ageing and edge effect of the encapsulating film to form the design value.

Thermal Conductivity

The *Kingspan OPTIM-R*™ element of the Roofing System achieves a thermal conductivity (λ -value) of 0.007 W/m·K (aged design value allowing for edge effect).

Thermal Resistance

Thermal resistance (R-value) of the *Kingspan OPTIM-R*™ element of the Roofing System varies with thickness and is calculated by dividing the thickness of the panel (expressed in metres) by the thermal conductivity.

Insulant Thickness (mm)	Thermal Resistance (m ² ·K/W)
20	2.857
25	3.571
30	4.285
40	5.714

Contact Details

Customer Service

For quotations, order placement and details of despatches please contact the Kingspan Insulation Customer Service Department on the numbers below:

UK	- Tel:	+44 (0) 1544 388 601
	- Fax:	+44 (0) 1544 388 888
	- email:	customerservice@kingspaninsulation.co.uk
Ireland	- Tel:	+353 (0) 42 979 5000
	- Fax:	+353 (0) 42 975 4299
	- email:	info@kingspaninsulation.ie

Literature & 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 or as individual product brochures, Kingspan Insulation technical literature is an essential specification tool. For copies please contact the Kingspan Insulation Marketing Department, or visit the Kingspan Insulation website, using the details below:

UK	- Tel:	+44 (0) 1544 387 384
	- Fax:	+44 (0) 1544 387 484
	- email:	literature@kingspaninsulation.co.uk
	- www.kingspaninsulation.co.uk/literature	
Ireland	- Tel:	+353 (0) 42 979 5000
	- Fax:	+353 (0) 42 975 4299
	- email:	info@kingspaninsulation.ie
	- www.kingspaninsulation.ie/literature	

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	- Tel:	+44 (0) 1544 387 383
	- Fax:	+44 (0) 1544 387 483
	- email:	tapered@kingspaninsulation.co.uk
Ireland	- Tel:	+353 (0) 42 975 4297
	- Fax:	+353 (0) 42 975 4296
	- email:	tapered@kingspaninsulation.ie

Technical Advice / Design

Kingspan Insulation supports all of its 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 Technical Service Department 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 Service Department can also give general application advice and advice on design detailing and fixing etc... Site surveys are also undertaken as appropriate.

The Kingspan Insulation British Technical Service Department operates under a management system certified to the BBA Scheme for Assessing the Competency of Persons to Undertake U-value and Condensation Risk Calculations.



Please contact the Kingspan Insulation Technical Service Department on the numbers below:

UK	- Tel:	+44 (0) 1544 387 382
	- Fax:	+44 (0) 1544 387 482
	- email:	technical@kingspaninsulation.co.uk
Ireland	- Tel:	+353 (0) 42 975 4297
	- Fax:	+353 (0) 42 975 4296
	- email:	technical@kingspaninsulation.ie

General Enquiries

For all other enquiries contact Kingspan Insulation on the numbers below:

UK	- Tel:	+44 (0) 1544 388 601
	- Fax:	+44 (0) 1544 388 888
	- email:	info@kingspaninsulation.co.uk
Ireland	- Tel:	+353 (0) 42 979 5000
	- Fax:	+353 (0) 42 975 4299
	- email:	info@kingspaninsulation.ie

Kingspan Insulation Ltd. reserves 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's Customer Service Department (see above left). 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 for 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 above), the advice of which should be sought for uses of Kingspan Insulation products that are not specifically described herein. Please check that your copy of this literature is current by contacting the Kingspan Insulation Marketing Department (see left).

Kingspan Insulation Ltd is a member of:
The National Insulation Association (NIA)



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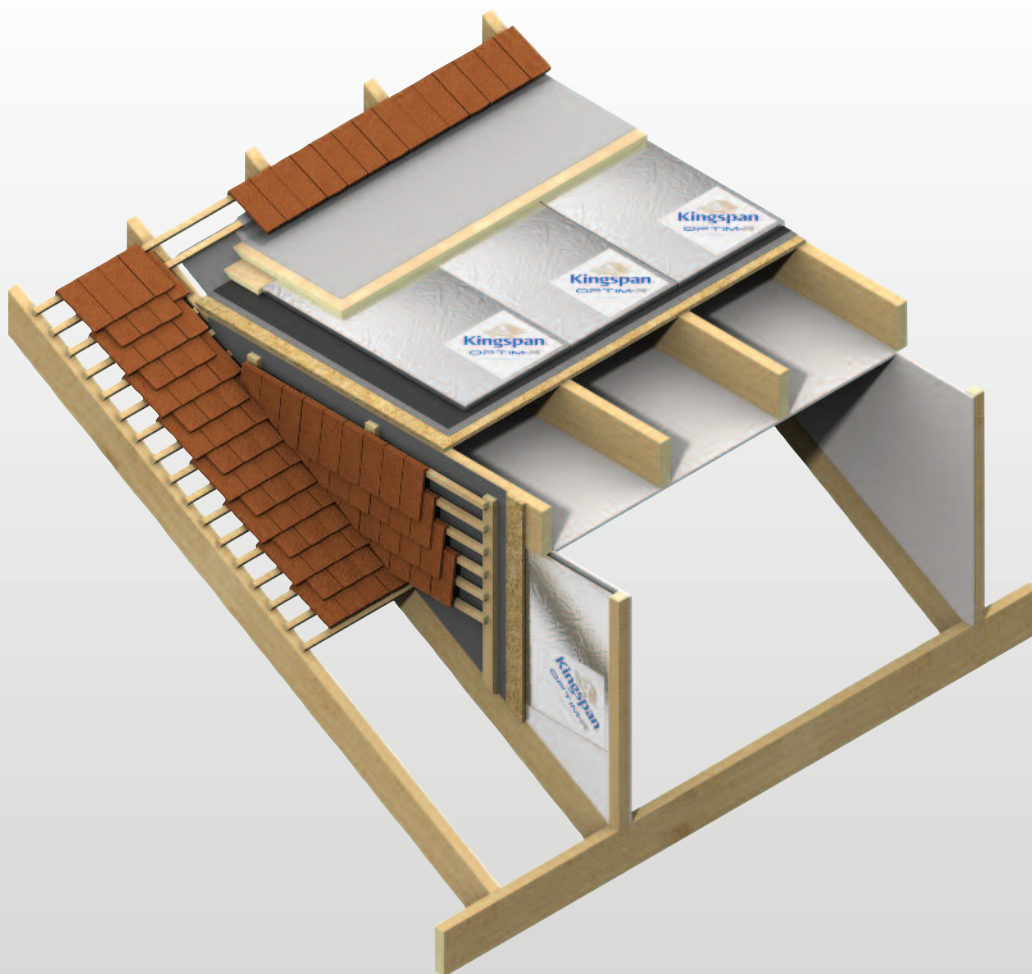
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OPTIM-R™ Dormer System

NEXT GENERATION INSULATION SOLUTION FOR DORMERS



- Optimum performance rigid vacuum insulation panel – aged design value thermal conductivity 0.007 W/m·K
- Insulating performance up to five times better than other commonly available insulation materials
- Ideal for constructions where a lack of construction depth or space is an issue
- Over 90% (by weight) recyclable
- Resistant to the passage of water vapour
- Ideal for new build and refurbishment
- Non-deleterious material



*Low Energy –
Low Carbon Buildings*

Introduction

The Problem

When constructing dormers in new build situations or replacing them in existing buildings there may be a requirement for both low U-values and the thinnest possible build-up.

For new-build applications, there are increasing regulatory requirements and economic reasons to improve energy efficiency. One of the approaches is to improve the thermal performance of the building fabric whilst keeping the overall construction as thin as possible. There are already high performance insulation products available that will fulfil the majority of these requirements, however in certain areas a new, thinner, product is needed.

In refurbishment there is arguably a greater need to keep dormer build-ups as thin as possible. In some constructions it may be difficult to install additional insulation and large thicknesses of insulation can considerably reduce the useable area of the dormer. In order to achieve low U-values, for example to meet Passivhaus standard, a dormer may need a significant thickness of insulation resulting in an aesthetically displeasing construction.

The Solution

The *Kingspan OPTIM-R™ Dormer System* has been developed to help solve these problems. The *Kingspan OPTIM-R™ Dormer System* is an optimum performance next generation insulation solution from Kingspan Insulation. It comprises of rigid vacuum insulation panels with a microporous core which is evacuated, encased and sealed in a thin, gas-tight envelope, giving outstanding thermal conductivity, with the thinnest possible solution to insulation problems. The vacuum insulation panels are accompanied by premium and high performance rigid insulation infill panels which can be used where the remaining dimension to infill is below 300 mm or can be cut to fit around problem areas such as roof or wall penetrations.

The *Kingspan OPTIM-R™ Dormer System* provides solutions for both dormer cheeks and dormer roofs, for example to enhance the aesthetic appearance of the dormer or to help comply with local planning laws. In retrofit applications, the *Kingspan OPTIM-R™ Dormer System* provides solutions for areas that previously could have remained un-insulated because of insufficient space available. In new constructions, the *Kingspan OPTIM-R™ Dormer System* could significantly enhance U-values in an area that may otherwise be accepted as denigrating the overall thermal performance.

With an aged design value thermal conductivity (λ) of 0.007 W/m·K, the *Kingspan OPTIM-R™ Dormer System* provides an insulating performance that is up to five times better than other commonly available insulation materials. The high level of thermal efficiency with minimal thickness, achieved by the *Kingspan OPTIM-R™ Dormer System* provides solutions for applications where a lack of construction depth or space is an issue.

Typical Constructions and U-values

Design Service

The *Kingspan OPTIM-R™ Dormer System* comprises 2 elements: *Kingspan OPTIM-R™* panels and *Kingspan OPTIM-R™ flex* infill panels. It comes with a supporting design service which ensures the ratio of the *Kingspan OPTIM-R™* element of the Dormer System to *Kingspan OPTIM-R™ flex* for each project is maximised. The panel layout will be designed quickly and effectively, ready for client approval. Each layout will illustrate the size, number and location of the *Kingspan OPTIM-R™* panels. It will also illustrate the size, number and location of any *Kingspan OPTIM-R™ flex* infill panels required.

For more details please contact the Kingspan Insulation Technical Service Department (see rear cover).

Assumptions

The U-values in the tables that follow have been calculated, under a management system certified to the BBA Scheme for Assessing the Competency of Persons to Undertake U-value and Condensation Risk Calculations, using the method detailed in BS / I.S. EN ISO 6946: 2007 (Building components and building elements. Thermal resistance and thermal transmittance. Calculation method) and using the conventions set out in BR443 (Conventions for U-value calculations). They are valid for the constructions shown in the details above each table.



N.B. For the dormer roof, the internal ceiling finish is taken to be a 3 mm skim coated 17.5 mm plasterboard.

N.B. 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.

N.B. The figures quoted are for guidance only. A detailed U-value calculation together with condensation risk analysis should be completed for each individual project.

N.B. To gain a comprehensive U-value calculation for your project please consult the Kingspan Insulation Technical Service Department for assistance (see rear cover).

Typical Constructions and U-values

Dormer Cheek

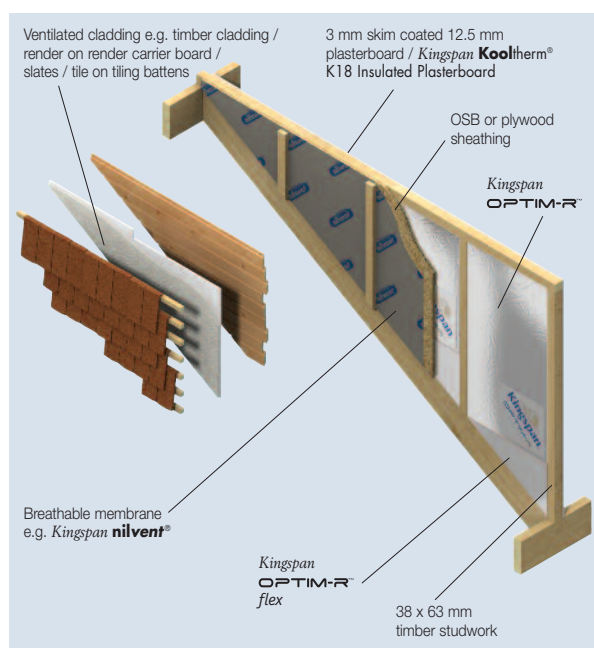


Figure 1

Kingspan OPTIM-R Dormer System thickness (mm)	Product thickness ^a Kingspan Kooltherm K18 Insulated Plasterboard (mm)	U-values (W/m ² ·K)
60	0**	0.32
60	32.5***	0.23
60	37.5***	0.21
60	42.5***	0.20
60	52.5***	0.18
60	62.5***	0.16
60	72.5***	0.15

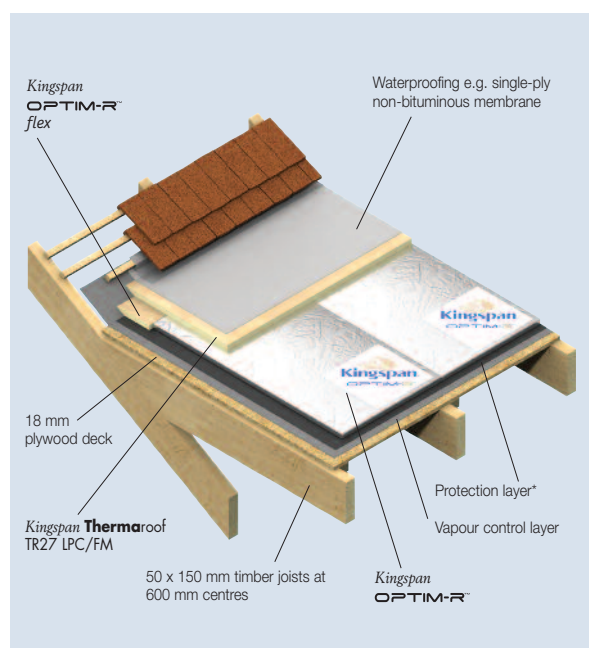
* Based on 20% bridging of the Kingspan **OPTIM-R** flex in a 38 x 63 mm stud. Timber bridging is taken as 15%.

** Calculations which feature insulation between studwork only, assume the use of 12.5 mm plasterboard and a polythene vapour control layer in order to minimise the risk of condensation. (See 'Design Considerations - Water Vapour Control').

*** Kingspan **Kooltherm** K18 Insulated Plasterboard contains an integral vapour control layer (See 'Design Considerations - Water Vapour Control').

^a Product thickness = insulant thickness + 12.5 mm plasterboard.

Dormer Roof



* Refer to Sitework

Figure 2

Kingspan OPTIM-R Dormer System thickness (mm)	Kingspan Thermo roof TR27 LPC/FM overlay thickness (mm)	U-values (W/m ² ·K)
20	25	0.29
25	25	0.26
30	25	0.23
40	25	0.19
50	25	0.16
60	25	0.14
40 + 30	25	0.13
40 + 40	25	0.11
40 + 50	25	0.10
50 + 50	25	0.09

* Based on 25% bridging of the Kingspan **OPTIM-R** flex.

Dormer Cheek Design Considerations

Responsible Sourcing

The *Kingspan OPTIM-R™ Dormer System* is manufactured under a management system certified to ISO 14001: 2004.

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 is available at

www.kingspaninsulation.co.uk/sustainabilityandresponsibility

Specification Clause

The *Kingspan OPTIM-R™* element of the Dormer System should be described in specifications as:-

The stud wall insulation shall be the *Kingspan OPTIM-R™ Dormer System* ___ mm thick: comprising a rigid vacuum insulation panel with a microporous core which is evacuated, encased and sealed in a thin, gas-tight envelope. The product shall be manufactured under a management system certified to ISO 9001: 2008, ISO 14001: 2008 and OHSAS 18001: 2007, and installed in accordance with the instructions issued by Kingspan Insulation Limited.

NBS Specifications

Details also available in NBS Plus.

NBS users should refer to clause:

P10 40 (Minor Works)



Repeating Thermal Bridges

When insulation is installed between timber studwork, the effects of repeating thermal bridges, caused by the studwork and noggins, must be taken into account. In most cases, this can represent up to or over 15% of the internal surface area of the building, which will significantly affect the overall U-value. This problem can be avoided by installing an additional layer of insulation either outside, or inside, the studwork.

Water Vapour Control / Condensation

Consideration should be given to the risk of condensation, when designing thermal elements.

In dormer cheeks, condensation can be controlled by ensuring there is a layer of high vapour resistance on the warm side of the insulation layer. If required, the vapour resistance of the wall lining can be increased by the use of a vapour check plasterboard*, the use of *Kingspan Kooltherm® K18 Insulated Plasterboard* which contains an integral vapour control layer*, the use of a layer of polythene sheeting*, or by the application of two coats of Gyproc Drywall Sealer.

**With appropriate detailing at joints, penetrations and wall perimeters.*

A condensation risk analysis should be carried out following the procedures set out in BS 5250: 2002 (Code of practice for the control of condensation in buildings). The Kingspan Insulation Technical Service Department (see rear cover) can provide this service.

Fire Stops

Current Building Regulations / Standards should be considered with regard to the requirements for, and provision of, fire stops.

Lightning Protection

Building designers should give consideration to the requirements of BS / I.S. EN 62305: 2006 (Protection against lightning).

Dormer Roof Design Considerations

Linear Thermal Bridging

Reasonable provision must be made to limit the effects of cold bridging. Please contact the Kingspan Insulation Technical Service Department for further advice (see rear cover).

Responsible Sourcing

The *Kingspan OPTIM-R™ Dormer System* is manufactured under a management system certified to ISO 14001: 2004.

Specification Clause

The *Kingspan OPTIM-R™* element of the Dormer System should be described in specifications as:-

The roof insulation shall be the *Kingspan OPTIM-R™ Dormer System* ___ mm thick: comprising a rigid vacuum insulation panel with a microporous core which is evacuated, encased and sealed in a thin, gas-tight envelope. The product shall be manufactured under a management system certified to ISO 9001: 2008, ISO 14001: 2008 and OHSAS 18001: 2007, and installed in accordance with the instructions issued by Kingspan Insulation Limited.

NBS Specifications

Details also available in NBS Plus.
NBS users should refer to clause(s):
J42 420, J42 430, J31 335
(Standard and Intermediate)
J42 10, J31 10 (Minor Works).



Water Vapour Control / Condensation

For the dormer roof, the *Kingspan OPTIM-R™ Dormer System* must be installed over a separate vapour control layer. A minimum vapour control layer should consist of a coated roofing felt complying with Type 3B to BS 747: 2000 (Reinforced bitumen sheets for Roofing. Specification), or S1P1 to BS 8747: 2007 (Reinforced bitumen membranes (RBMs) for roofing. Guide to selection and specification). Alternative vapour control layers should be discussed with the Kingspan Insulation Technical Service Department (see rear cover).

Where the separate vapour control layer is to be bonded, allowance should be made for adequate bonding of the vapour control layer to the substrate, so as to provide a suitable surface upon which to lay the insulation panels and sufficient resistance to wind up-lift (see 'Wind Loading').

A condensation risk analysis should be carried out in accordance with BS 5250: 2002 (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 roofing element of the *Kingspan OPTIM-R™ Dormer System*, whilst also ensuring any condensation risk is within the limits given in BS 5250: 2002.

Dormer Roof Design Considerations

Wind Loading

Wind loadings should be assessed in accordance with BS 6399-2: 1997 (Loadings for buildings. Code of practice for wind loads) or BS / I.S. EN 1991-1-4: 2005 (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 (e.g. on a hill side); and
- topographical value of the surrounding areas.

Falls

The fall on a dormer roof, constructed using the *Kingspan OPTIM-R™ Dormer System* is normally provided by the supporting structure being directed towards the rainwater outlets. The fall should be smooth and steep enough to prevent the formation of rainwater ponds. In order 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 is advisable to design in even greater falls. These can be provided by the *Kingspan OPTIM-R™ Dormer System* when used in conjunction with a Kingspan tapered insulation overlay system (see below).

Tapered Roofing

The *Kingspan OPTIM-R™ Dormer System* can also be used in a tapered scheme. The scheme comes with a supporting design service. This ensures that the most cost-effective solution for a dormer roof is identified and that the end result is a tapered system design which meets a dormer's rainwater run-off and insulation requirements. For more details please contact the Kingspan Insulation Tapered Roofing Department (see rear cover), which should be consulted as early as possible in the process of designing a roof.

Roof Waterproofing

The *Kingspan OPTIM-R™ Dormer System*, when used in conjunction with an overlay of *Kingspan Thermoroof® TR27 LPC/FM*, is suitable for use with most fully adhered single-ply waterproofing membranes. When using the *Kingspan OPTIM-R™ Dormer System* with fully adhered single-ply waterproofing membranes, the joints between the *Kingspan Thermoroof® TR27 LPC/FM*, immediately below the waterproofing membrane, can be taped with a min. 50 mm wide foil tape (refer to the appropriate single-ply membrane manufacturer's instructions). Please contact the Kingspan Insulation Technical Service Department (see rear cover) to check waterproofing membrane and proprietary adhesive system compatibility. Advice should be sought, from the appropriate waterproofing membrane manufacturer, in relation to the requirement for the use of a fleece backed membrane with the waterproofing membrane in question.

The *Kingspan OPTIM-R™ Dormer System* is, when used in conjunction with an overlay of *Kingspan Thermoroof® TR27 LPC/FM*, also suitable for use with some cold liquid applied waterproofing systems. When using the *Kingspan OPTIM-R™ Dormer System* with cold liquid applied waterproofing systems, a carrier membrane for the waterproofing must be installed over the *Kingspan Thermoroof® TR27 LPC/FM*. Advice should be sought, from the waterproofing system manufacturer, about the specification of the carrier membrane and the compatibility of the waterproofing system with the *Kingspan OPTIM-R™ Dormer System*. For further advice please contact the Kingspan Insulation Technical Service Department (see rear cover).

Dormer Cheek Sitework

Ventilated Cladding

Timber Frame Wall with Insulation Between Studs

- If the *Kingspan OPTIM-R™* and *Kingspan OPTIM-R™ flex* infill panels are to be fitted so that they are flush with the outside surface of the timber studs, they must be installed tight up against pre-installed OSB or plywood sheathing.
 - Once the *Kingspan OPTIM-R™* and *Kingspan OPTIM-R™ flex* are fitted in place, nail treated softwood battens to the side of the studs, to provide a 'stop' to prevent the panels from moving within the stud cavity. Care must be taken to ensure that the *Kingspan OPTIM-R™* element of the Dormer System is not punctured or damaged in this process.
 - When utilising the *Kingspan OPTIM-R™ Dormer System* between studwork with no insulated sheathing, a vapour control layer should be installed. This can be provided by vapour check plasterboard*, *Kingspan Kooltherm® K18 Insulated Plasterboard**, the use of a layer of polythene sheeting*, or by the application of two coats of Gyproc Drywall Sealer.
- *With appropriate detailing at joints, penetrations and wall perimeters.
- Ensure there is a tight fit between the *Kingspan OPTIM-R™* element of the Dormer System and the adjoining studs and other timbers. Where runs of the *Kingspan OPTIM-R™* element of the Dormer System do not accurately fit the dimension between studwork, the use of *Kingspan OPTIM-R™ flex* is required to fill any gaps.
 - Fill any gaps with an appropriate expanding urethane sealant.

- A breathable membrane, e.g. *Kingspan nilvent®*, is fitted to the OSB or plywood sheathing / exterior of the insulated frame, and temporarily stapled or pinned in place.
- Preservative treated battens are fixed vertically to the wall structure, through the breathable membrane, ensuring that the battens and fixings are coincident with the underlying timber studs, head rails and sole plates. Care must be taken to ensure fasteners do not penetrate the *Kingspan OPTIM-R™* element of the Dormer System.
- When selecting the type of fixing and fixing frequency for the battens, consideration must be given to the weight of cladding to be fixed to them, the design of the wall and wind loading.
- If the cladding system is to be tile hung, horizontal tiling battens can then be fixed to the vertical battens, and the tiles fixed to them.
- Alternatively, timber cladding can be fixed directly to the vertical battens.
- If the cladding is to be finished with render, the render carrier (e.g. calcium silicate board, expanded metal lath) can be fixed directly to the vertical battens.
- Insulation advice should be sought from the breathable membrane manufacturer, and the ventilated cladding system should be secured in accordance with its manufacturer's recommendations.

Dormer Roof Sitework

Installing over Plywood Decks

- Plywood decks should be clean, dry, without projections (including fixing heads etc.), steps or gaps, and should be graded to allow correct falls to all rainwater outlets.
- In order to ensure an adequate bond between the plywood deck and the vapour control layer, the plywood deck should be suitably primed, in accordance with the primer manufacturer's instructions, prior to the application of the adhesive system, used to bond the vapour control layer to the deck.
- Where one run of the specified vapour control layer laps another, there should be minimum 150 mm side and end overlaps, which should be adequately sealed.
- Turn up the vapour control layer at the edge of the dormer roof to a height appropriate to the specified waterproofing membrane.
- An optional protection layer may be used under the *Kingspan OPTIM-R™ Dormer System*. For further information please contact the Kingspan Insulation Technical Service Department (see rear cover).
- The *Kingspan OPTIM-R™* element of the Dormer System should be laid chessboard pattern where practical, with joints lightly butted. There should be no gaps at abutments.
- Where runs of the *Kingspan OPTIM-R™* element of the Dormer System do not accurately fit the dimension of the dormer roof, the use of *Kingspan OPTIM-R™ flex* is required to make up this difference. Each *Kingspan OPTIM-R™ flex* panel is to be the same thickness as the *Kingspan OPTIM-R™* element of the Dormer System.
- Both the *Kingspan OPTIM-R™* element of the Dormer System and the *Kingspan OPTIM-R™ flex* should be bonded down using an appropriate proprietary adhesive system.
- At the perimeter of the dormer roof or where any other penetrations are present, *Kingspan OPTIM-R™ flex* should be laid abutting these areas, in strips no less than 200 mm wide, to take account of building tolerances and to provide a zone to allow for peel restraint mechanical fixing of the membrane should it be required. Refer to the waterproofing manufacturer for guidance on appropriate peel restraint detailing.
- The *Kingspan Thermaroof® TR27 LPC/FM* overlay should be laid as soon as possible to avoid exposure of the *Kingspan OPTIM-R™* element of the Dormer System to direct foot traffic.
- The *Kingspan Thermaroof® TR27 LPC/FM* overlay should be bonded to the upper surface of the *Kingspan OPTIM-R™* and *Kingspan OPTIM-R™ flex* using an appropriate proprietary adhesive system prior to the application of the waterproof covering.
- The waterproofing membrane is installed in accordance with the membrane manufacturer's instructions, over the whole insulated area including any insulation upstands, as soon as possible after laying the insulation boards.

Installing over Existing Flat Roof

- The *Kingspan OPTIM-R™ Dormer System* is suitable for use over existing flat roofs. For further information please contact the Kingspan Insulation Technical Service Department (see rear cover).

Kingspan **OPTIM-R**[™] Dormer System Sitework

Wheeled / Foot Traffic

- The *Kingspan **OPTIM-R*** element of the Dormer System should not be walked on. A protective foot or crawl board should be used during the installation process.
- *Kingspan **OPTIM-R flex*** and the insulation overlay may be walked on.

General

- The *Kingspan **OPTIM-R*** element of the Dormer System should not be used in association with solvent-based adhesive systems.
- The *Kingspan **OPTIM-R*** element of the Dormer System should not be exposed to naked flames or excessive heat.

Cutting

- The *Kingspan **OPTIM-R*** element of the Dormer System should not be cut or penetrated.
- The substrate must be clean, dry and level, and free of sharp objects or edges.
- Cutting of the *Kingspan **OPTIM-R flex*** infill panels should be carried out either by using a fine toothed saw, or by scoring with a sharp knife, snapping the board over a straight edge and then cutting the facing on the other side.
- Ensure accurate trimming of *Kingspan **OPTIM-R flex*** to achieve close-butting joints and continuity of insulation.

Availability

- Please contact Kingspan Insulation for availability of the *Kingspan **OPTIM-R*** Dormer System.

Packaging and Storage

- The packaging of the *Kingspan **OPTIM-R*** Dormer System should not be considered adequate for outdoor protection. The *Kingspan **OPTIM-R*** Dormer System should be stored inside a building and raised off the floor.

Health and 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.

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 panel 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.

The reflective facing used on this product can be slippery underfoot when wet. Therefore, it is recommended that any excess material should be contained to avoid a slip hazard.

Product Details

Composition

The *Kingspan OPTIM-R™* element of the Dormer System comprises a rigid vacuum insulation panel with a microporous core which is evacuated, encased and sealed in a thin, gas-tight envelope.

For dormer cheeks, the *Kingspan OPTIM-R™ flex* element of the Dormer System comprises a premium performance rigid insulation faced on both sides with a composite foil facing.

For dormer roofs, the *Kingspan OPTIM-R™ flex* element of the Dormer System comprises a high performance rigid insulation faced on both sides with a coated glass tissue.

Standards and Approvals

The *Kingspan OPTIM-R™ Dormer System* is manufactured to the highest standards under a management system certified to ISO 9001: 2008 (Quality Management Systems. Requirements), ISO 14001: 2004 (Environmental Management Systems. Requirements) and OHSAS 18001: 2007 (Health and Safety Management Systems. Requirements).

Standard Dimensions

The *Kingspan OPTIM-R™ Dormer System* panels are available in the following standard size(s):

Nominal Dimension	Availability
Length (mm)	300 – 1200
Width (mm)	300 – 600
Insulant Thickness (mm)	20 – 60

Other sizes may be available dependent on order quantity. Please contact Kingspan Insulation for more details.

Compressive Strength

The compressive strength of the *Kingspan OPTIM-R™* element of the Dormer System typically exceeds 160 kPa at 10% compression when tested to BS / I.S. EN ISO 826: 1996 (Thermal insulating products for building application. Determination of compression behaviour).

Durability

If installed correctly and protected from damage and penetration, the *Kingspan OPTIM-R™ Dormer System* will provide reliable long-term thermal performance over the lifetime of the building.

Resistance to Solvents, Fungi & Rodents

The *Kingspan OPTIM-R™ Dormer System* should not be used in association with solvent-based adhesive systems. Damaged boards or boards that have been in contact with solvents or acids should not be used.

The insulation core and facings used in the manufacture of the *Kingspan OPTIM-R™ Dormer System* resist attack by mould and microbial growth, and do not provide any food value to vermin.

Fire Performance

The *Kingspan OPTIM-R™ Dormer System*, when subjected to the British Standard fire test, specified in the table below, will achieve the result shown, when waterproofed with a single-ply waterproofing membrane.

Test	Result
BS 476-3: 2004 (External fire exposure roof test)	Dependent on single-ply membrane adopted

Further 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 / I.S. EN 12667: 2001 (Thermal performance of building materials and products. Determination of thermal resistance by means of guarded hot plate and heat flow meter methods. Products of high and medium thermal resistance), with allowance for ageing and edge effect of the encapsulating film to form the design value.

Thermal Conductivity

The *Kingspan OPTIM-R™* element of the Dormer System achieves a thermal conductivity (λ -value) of 0.007 W/m·K (aged design value allowing for edge effect).

Thermal Resistance

Thermal resistance (R-value) of the *Kingspan OPTIM-R™* element of the Dormer System varies with thickness and is calculated by dividing the thickness of the panel (expressed in metres) by the thermal conductivity.

Insulant Thickness (mm)	Thermal Resistance (m ² ·K/W)
20	2.857
25	3.571
30	4.285
40	5.714
50	7.143
60	8.571

Contact Details

Customer Service

For quotations, order placement and details of despatches please contact the Kingspan Insulation Customer Service Department on the numbers below:

UK	- Tel:	+44 (0) 1544 388 601
	- Fax:	+44 (0) 1544 388 888
	- email:	customerservice@kingspaninsulation.co.uk
Ireland	- Tel:	+353 (0) 42 979 5000
	- Fax:	+353 (0) 42 975 4299
	- email:	info@kingspaninsulation.ie

Literature & 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 or as individual product brochures, Kingspan Insulation technical literature is an essential specification tool. For copies please contact the Kingspan Insulation Marketing Department, or visit the Kingspan Insulation website, using the details below:

UK	- Tel:	+44 (0) 1544 387 384
	- Fax:	+44 (0) 1544 387 484
	- email:	literature@kingspaninsulation.co.uk
	- www.kingspaninsulation.co.uk/literature	
Ireland	- Tel:	+353 (0) 42 979 5000
	- Fax:	+353 (0) 42 975 4299
	- email:	info@kingspaninsulation.ie
	- www.kingspaninsulation.ie/literature	

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	- Tel:	+44 (0) 1544 387 383
	- Fax:	+44 (0) 1544 387 483
	- email:	tapered@kingspaninsulation.co.uk
Ireland	- Tel:	+353 (0) 42 975 4297
	- Fax:	+353 (0) 42 975 4296
	- email:	tapered@kingspaninsulation.ie

Technical Advice / Design

Kingspan Insulation supports all of its 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 Technical Service Department 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 Service Department can also give general application advice and advice on design detailing and fixing etc... Site surveys are also undertaken as appropriate.

The Kingspan Insulation British Technical Service Department operates under a management system certified to the BBA Scheme for Assessing the Competency of Persons to Undertake U-value and Condensation Risk Calculations.



Please contact the Kingspan Insulation Technical Service Department on the numbers below:

UK	- Tel:	+44 (0) 1544 387 382
	- Fax:	+44 (0) 1544 387 482
	- email:	technical@kingspaninsulation.co.uk
Ireland	- Tel:	+353 (0) 42 975 4297
	- Fax:	+353 (0) 42 975 4296
	- email:	technical@kingspaninsulation.ie

General Enquiries

For all other enquiries contact Kingspan Insulation on the numbers below:

UK	- Tel:	+44 (0) 1544 388 601
	- Fax:	+44 (0) 1544 388 888
	- email:	info@kingspaninsulation.co.uk
Ireland	- Tel:	+353 (0) 42 979 5000
	- Fax:	+353 (0) 42 975 4299
	- email:	info@kingspaninsulation.ie

Kingspan Insulation Ltd. reserves 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's Customer Service Department (see above left). 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 for 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 above), the advice of which should be sought for uses of Kingspan Insulation products that are not specifically described herein. Please check that your copy of this literature is current by contacting the Kingspan Insulation Marketing Department (see left).

Kingspan Insulation Ltd is a member of:
The National Insulation Association (NIA)



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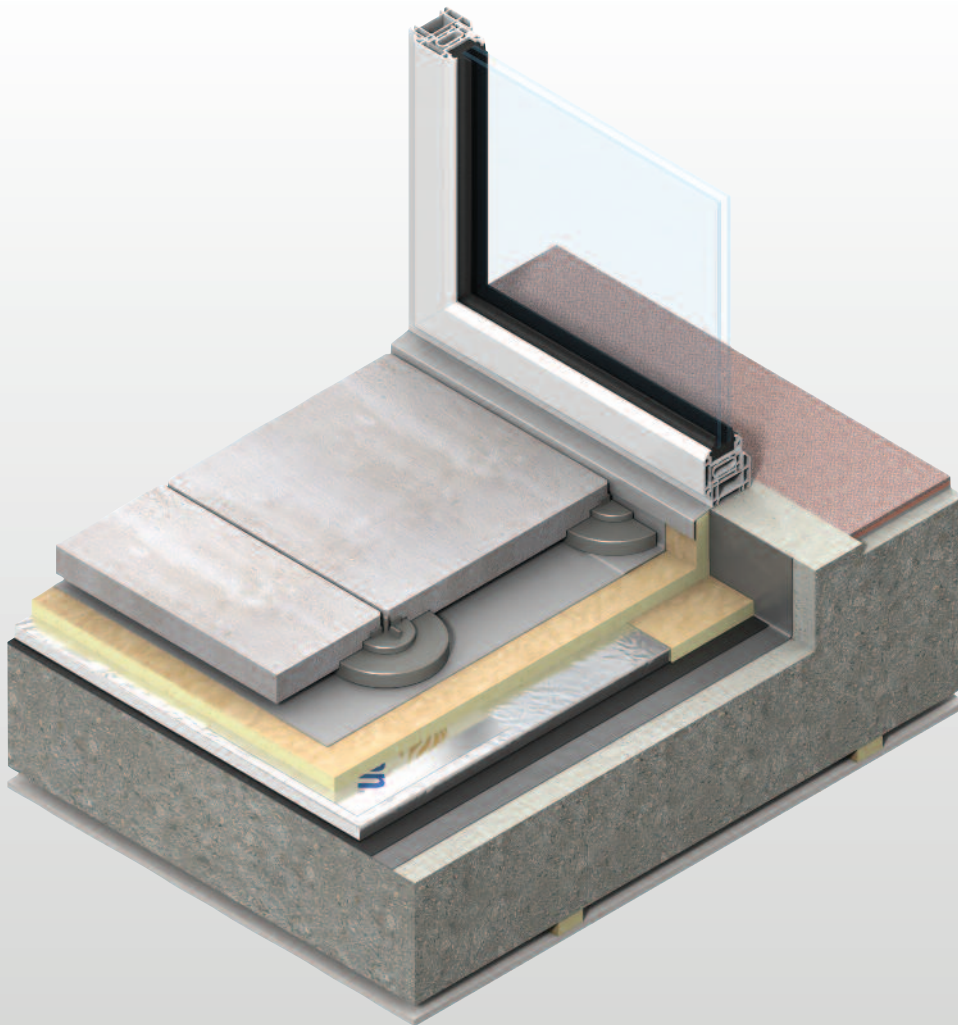
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OPTIM-R™ Balcony & Terrace System

NEXT GENERATION INSULATION SOLUTION
FOR BALCONIES AND TERRACES



- Optimum performance rigid vacuum insulation panel – aged design value thermal conductivity 0.007 W/m·K
- Insulating performance up to five times better than other commonly available insulation materials
- Ideal for height restrictions – can maintain an even transition between indoor and outdoor levels
- Over 90% (by weight) recyclable
- Resistant to the passage of water vapour
- Ideal for new build and refurbishment
- Non-deleterious material



*Low Energy –
Low Carbon Buildings*

Introduction

The Problem

When constructing balconies or terraces in new build situations or replacing them in existing buildings there may be a requirement for both low U-values and the thinnest possible build-up.

For new-build applications, there are increasing regulatory requirements and economic reasons to improve energy efficiency. One of the approaches is to improve the thermal performance of the building fabric whilst keeping the overall construction as thin as possible. There are already high performance insulation products available that will fulfil the majority of these requirements, however in certain areas a new, thinner, product is needed. Balconies and terraces are such areas that may require both low U-values and a thin aesthetically-pleasing solution.

Existing balconies and terraces are often problem areas with little space for installing new insulation. In order to meet the required U-value, very often the insulation must be installed both on top of and on the underside of the balcony or terrace. Not only can this be time-consuming but it can also pose a condensation risk.

The Solution

The **Kingspan OPTIM-R™ Balcony & Terrace System** has been developed to help solve these problems. The **Kingspan OPTIM-R™ Balcony & Terrace System** is an optimum performance next generation insulation solution from Kingspan Insulation. It comprises of rigid vacuum insulation panels with a microporous core which is evacuated, encased and sealed in a thin, gas-tight envelope, giving outstanding thermal conductivity, with the thinnest possible solution to insulation problems. The vacuum insulation panels are accompanied by high performance rigid insulation infill panels which can be cut to fit around problem areas such as drainage gutters.

In retrofit applications, the **Kingspan OPTIM-R™ Balcony & Terrace System** can be used to avoid height differences between the building interior and the balcony or terrace. In new constructions the **Kingspan OPTIM-R™ Balcony & Terrace System** can significantly enhance U-values in an area that would otherwise be accepted as denigrating the overall thermal performance.

With an aged design value thermal conductivity (λ) of 0.007 W/m·K, the **Kingspan OPTIM-R™ Balcony & Terrace System** provides an insulating performance that is up to five times better than other commonly available insulation materials. The high level of thermal efficiency with minimal thickness, achieved by the **Kingspan OPTIM-R™ Balcony & Terrace System** provides solutions for applications where a lack of construction depth or space is an issue.

Design Service

The **Kingspan OPTIM-R™ Balcony & Terrace System** comprises 2 elements: **Kingspan OPTIM-R™** panels and **Kingspan OPTIM-R™ flex** infill panels. It comes with a supporting design service which ensures the ratio of the **Kingspan OPTIM-R™** element of the Balcony & Terrace System to **Kingspan OPTIM-R™ flex** for each project is maximised. The panel layout will be designed quickly and effectively, ready for client approval. Each layout will illustrate the size, number and location of the **Kingspan OPTIM-R™** panels. It will also illustrate the size, number and location of any **Kingspan OPTIM-R™ flex** infill panels required. An example of a typical design layout can be seen below.

For more details please contact the Kingspan Insulation Technical Service Department (see rear cover).

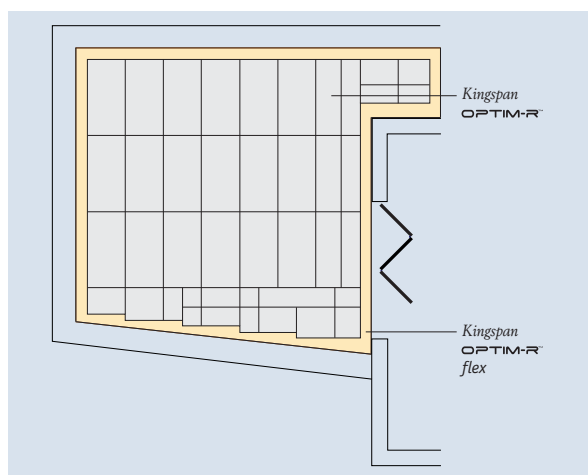


Figure 1

Typical Constructions and U-values

Assumptions

The U-values in the tables that follow have been calculated, under a management system certified to the BBA Scheme for Assessing the Competency of Persons to Undertake U-value and Condensation Risk Calculations, using the method detailed in BS / I.S. EN ISO 6946: 2007 (Building components and building elements. Thermal resistance and thermal transmittance. Calculation method) and using the conventions set out in BR443 (Conventions for U-value calculations). They are valid for the constructions shown in the details adjacent to each table.



N.B. 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.

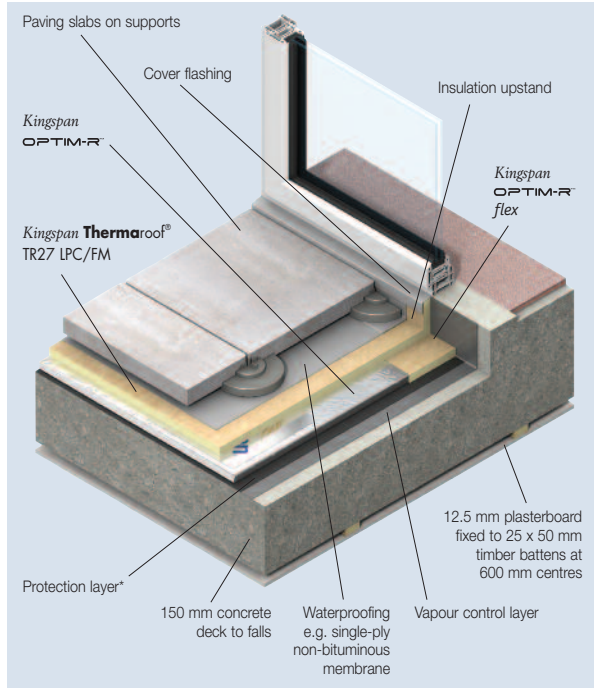
N.B. The figures quoted are for guidance only. A detailed U-value calculation together with condensation risk analysis should be completed for each individual project.

N.B. To gain a comprehensive U-value calculation for your project please consult the Kingspan Insulation Technical Service Department for assistance (see rear cover).

N.B. For the purposes of these calculations, the bridging effect of Kingspan OPTIM-R flex has been taken to be 20%.

Concrete Deck

Dense Concrete Deck with Suspended Ceiling and Kingspan Thermaroof® TR27 LPC/FM Overlay



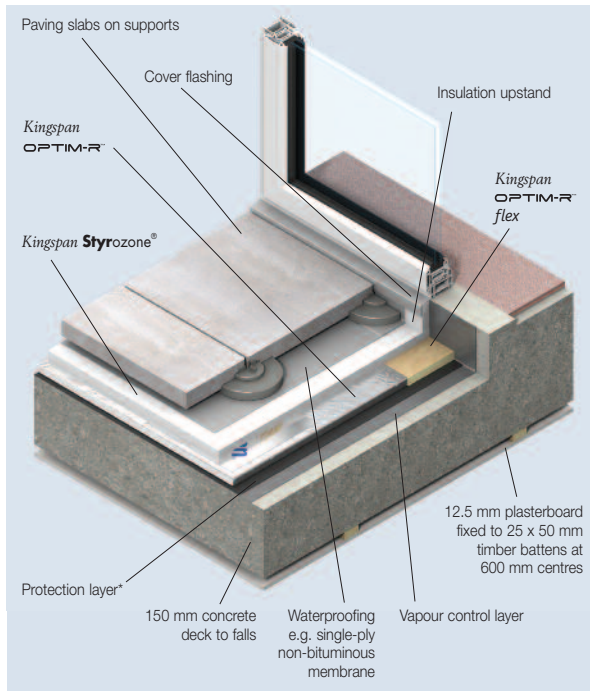
* Refer to Sitework

Figure 2

Kingspan OPTIM-R™ Balcony & Terrace System thickness (mm)	Kingspan Thermaroof TR27 LPC/FM overlay thickness (mm)	U-values (W/m²·K)
20	25	0.28
25	25	0.25
30	25	0.22
40	25	0.18
50	25	0.16
60	25	0.14
40 + 30	25	0.12
40 + 40	25	0.11
40 + 50	25	0.10
50 + 50	25	0.09

Typical Constructions and U-values

Dense Concrete Deck with Suspended Ceiling and Kingspan Styrozone® Overlay (Heavy Traffic areas)



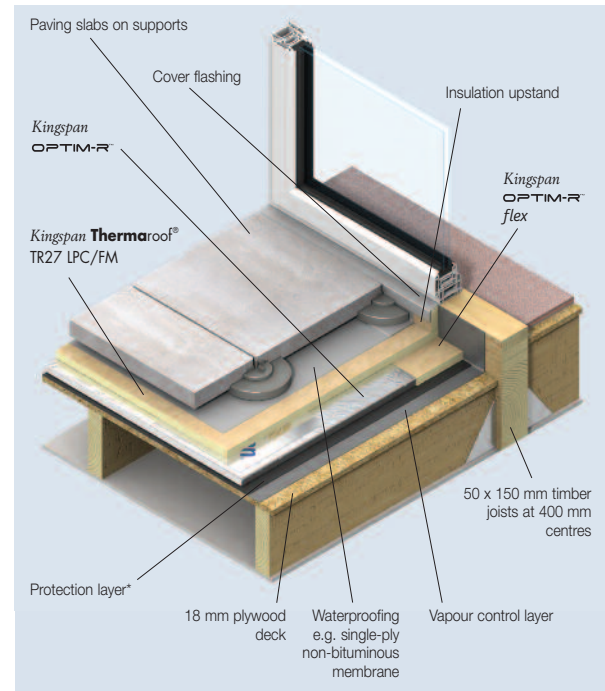
* Refer to Sitework

Figure 3

Kingspan OPTIM-R™ Balcony & Terrace System thickness (mm)	Kingspan Styrozone® overlay thickness (mm)	U-values (W/m ² ·K)
20	30	0.28
25	30	0.25
30	30	0.22
40	30	0.18
50	30	0.16
60	30	0.14
40 + 30	30	0.12
40 + 40	30	0.11
40 + 50	30	0.10
50 + 50	30	0.09

Timber Deck

Timber Deck with Plasterboard Ceiling and Kingspan Thermaroof® TR27 LPC/FM Overlay



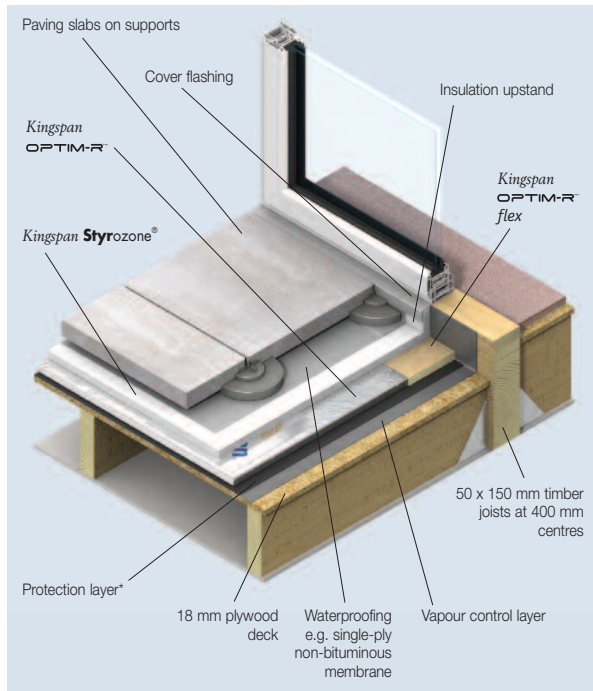
* Refer to Sitework

Figure 4

Kingspan OPTIM-R™ Balcony & Terrace System thickness (mm)	Kingspan Thermaroof® TR27 LPC/FM overlay thickness (mm)	U-values (W/m ² ·K)
20	25	0.27
25	25	0.25
30	25	0.22
40	25	0.18
50	25	0.15
60	25	0.14
40 + 30	25	0.12
40 + 40	25	0.11
40 + 50	25	0.10
50 + 50	25	0.09

Design Considerations

Timber Deck with Plasterboard Ceiling and Kingspan Styrozone® Overlay (Heavy Traffic areas)



* Refer to Sitework

Figure 5

Kingspan OPTIM-R™ Balcony & Terrace System thickness (mm)	Kingspan Styrozone® overlay thickness (mm)	U-values (W/m ² ·K)
20	30	0.28
25	30	0.25
30	30	0.22
40	30	0.18
50	30	0.16
30 + 30	30	0.14
40 + 30	30	0.12
40 + 40	30	0.11
40 + 50	30	0.10
50 + 50	30	0.09

Linear Thermal Bridging

Reasonable provision must be made to limit the effects of cold bridging. The design should ensure that roof-light or ventilator kerbs etc. are insulated with a 25 mm thick insulation board of **Kingspan Thermo roof® TR27 LPC/FM** or **Kingspan Styrozone®**. Where upstands exist a minimum 25 mm thickness of **Kingspan Thermo roof® TR27 LPC/FM** or **Kingspan Styrozone®** should also be used around the perimeter of the balcony or the terrace on the internal façade of the parapets. A minimum distance of 300 mm should be maintained between the top of the insulation upstand and the bottom of the horizontal balcony or terrace insulation. Wall insulation should also be carried up into parapets as high as the flat roof insulation upstand.

Please contact the Kingspan Insulation Technical Service Department (see rear cover) for further advice.

Responsible Sourcing

The **Kingspan OPTIM-R™ Balcony & Terrace System** is manufactured under a management system certified to ISO 14001: 2004.

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 is available at

www.kingspaninsulation.co.uk/sustainabilityandresponsibility.

Specification Clause

The **Kingspan OPTIM-R™** element of the Balcony & Terrace System should be described in specifications as:-

The roof insulation shall be the **Kingspan OPTIM-R™ Balcony & Terrace System** ___ mm thick: comprising a rigid vacuum insulation panel with a microporous core which is evacuated, encased and sealed in a thin, gas-tight envelope. The product shall be manufactured under a management system certified to ISO 9001: 2008, ISO 14001: 2008 and OHSAS 18001: 2007, and installed in accordance with the instructions issued by Kingspan Insulation.

Design Considerations

NBS Specifications

Details also available in NBS Plus.
NBS users should refer to clause(s):
J42 420, J42 430, J31 335
(Standard and Intermediate)
J42 10, J31 10 (Minor Works).



Wind Loading

Wind loadings should be assessed in accordance with BS 6399-2: 1997 (Loadings for buildings. Code of practice for wind loads) or BS / I.S. EN 1991-1-4: 2005 (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 (e.g. on a hill side); and
- topographical value of the surrounding area.

Falls

The fall on a balcony or terrace, constructed using the *Kingspan OPTIM-R™ Balcony & Terrace System* is normally provided by the supporting structure being directed towards the rainwater outlets. The fall should be smooth and steep enough to prevent the formation of rainwater ponds. In order 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 is advisable to design in even greater falls. These can be provided by the *Kingspan OPTIM-R™ Balcony & Terrace System* when used in conjunction with an overlay of *Kingspan Thermaicaper® TT47 LPC/FM* (see below).

Tapered Roofing

The *Kingspan OPTIM-R™ Balcony & Terrace System* can also be used in a tapered scheme. The scheme comes with a supporting design service. This ensures that the most cost-effective solution for a balcony or terrace is identified and that the end result is a tapered system design which meets a balcony or terrace's rainwater run-off and insulation requirements. For more details please contact the Kingspan Insulation Tapered Roofing Department (see rear cover), which should be consulted as early as possible in the process of designing a roof.

Roof Loading / Traffic

The insulation overlay used in the *Kingspan OPTIM-R™ Balcony & Terrace System* will depend on the specific foot traffic regimes of the construction.

For further advice on the acceptability of specific foot traffic regimes and different insulation overlay materials, please contact the Kingspan Insulation Technical Service Department (see rear cover).

Green Roof Terraces

The *Kingspan OPTIM-R™ Balcony & Terrace System* is suitable for use under most warm green roof terrace systems.

Green roof systems are a specialist design area. When designing a loose-laid insulated green roof assembly consideration needs to be given to the following.

Green roof systems are required to have a minimum dry weight of 80 kg/m² to ballast the insulation boards beneath them. However, the total required dry weight will depend upon wind uplift, which in turn will vary with the geographical location of the building, local topography, and the height and the width of the roof concerned. The necessity for any additional dry weight should be assessed in accordance with BS 6399-2: 1997 (Loading for Buildings. Code of practice for wind loads) or BS / I.S. EN 1991-1-4: 2005 (National Annex to Eurocode 1 Actions on structures. General Actions. Wind Actions).

When installing a loose-laid insulated green roof assembly, any insulation must be immediately over-laid with the green roof system, which must meet all of the requirements outlined above.

Where these requirements cannot be ensured, the insulation must be bonded down (see Sitework). For further information please contact the Kingspan Insulation Technical Service Department (see rear cover).

Roof Waterproofing

The *Kingspan OPTIM-R™ Balcony & Terrace System*, when used in conjunction with an overlay of *Kingspan Thermaroof® TR27 LPC/FM*, is suitable for use with most fully adhered single-ply waterproofing membranes. When using the *Kingspan OPTIM-R™ Balcony & Terrace System* with fully adhered single-ply waterproofing membranes, the joints between the *Kingspan Thermaroof® TR27 LPC/FM*, immediately below the waterproofing membrane, can be taped with a min. 50 mm wide foil tape (refer to the appropriate single-ply membrane manufacturer's instructions). Please contact the Kingspan Insulation Technical Service Department (see rear cover) to check waterproofing membrane and proprietary adhesive system compatibility. Advice should be sought, from the appropriate waterproofing membrane manufacturer, in relation to the requirement for the use of a fleece backed membrane with the waterproofing membrane in question.

The *Kingspan OPTIM-R™ Balcony & Terrace System*, when used in conjunction with an overlay of *Kingspan Thermaroof® TR27 LPC/FM*, is also suitable for use with some cold liquid applied waterproofing systems. When using the *Kingspan OPTIM-R™ Balcony & Terrace System* with cold liquid applied waterproofing systems, a carrier membrane for the waterproofing must be installed over the *Kingspan Thermaroof® TR27 LPC/FM*. Advice should be sought, from the waterproofing system manufacturer, about the specification of the carrier membrane and the compatibility of the waterproofing system with the *Kingspan OPTIM-R™ Balcony & Terrace System*. For further advice please contact the Kingspan Insulation Technical Service Department (see rear cover).

The *Kingspan OPTIM-R™ Balcony & Terrace System*, when used in conjunction with an overlay of *Kingspan Styrozone®*, is suitable for use with most fleece backed single ply waterproofing membranes. The waterproofing membrane can be either fully adhered or loose laid when ballasted. Advice should be sought from the appropriate membrane manufacturer.

Water Vapour Control

The *Kingspan OPTIM-R™ Balcony & Terrace System* must be installed over a separate vapour control layer. A minimum vapour control layer should consist of a coated roofing felt complying with Type 3B to BS 747: 2000 (Reinforced bitumen sheets for roofing. Specification), or S1P1 to BS 8747: 2007 (Reinforced bitumen membranes (RBMs) for roofing. Guide to selection and specification). Alternative vapour control layers should be discussed with the Kingspan Insulation Technical Service Department (see rear cover).

Where the separate vapour control layer is to be bonded, allowance should be made for adequate bonding of the vapour control layer to the substrate, so as to provide a suitable surface upon which to lay the insulation panels and sufficient resistance to wind up-lift (see 'Wind Loading').

Condensation Risk Analysis

Included in the design service is the calculation of condensation risk in accordance with BS 5250: 2002 (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 *Kingspan OPTIM-R™ Balcony & Terrace System*, whilst also ensuring any condensation risk is within the limits given in BS 5250: 2002.

Sitework

Installing over Concrete Decks

- Concrete decks should be clean, dry, without projections (including fixing heads etc.), steps or gaps, and should be graded to allow correct falls to all rainwater outlets.
- In order to ensure an adequate bond between the concrete deck and the vapour control layer, the concrete deck should be suitably primed, in accordance with the primer manufacturer's instructions, prior to the application of the adhesive system, used to bond the vapour control layer to the deck.
- Where one run of the specified vapour control layer laps another, there should be minimum 150 mm inside and end overlaps, which should be adequately sealed.
- Turn up the vapour control layer at the edge of the roof to a height appropriate to the specified waterproofing membrane.
- An optional protection layer may be used under the *Kingspan OPTIM-R™ Balcony & Terrace System*. For further information please contact the Kingspan Insulation Technical Service Department (see rear cover).
- The *Kingspan OPTIM-R™* element of the Balcony & Terrace System should be laid chessboard pattern where practical, with joints lightly butted. There should be no gaps at abutments.
- Where runs of the *Kingspan OPTIM-R™* element of the Balcony & Terrace System do not accurately fit the dimension of the balcony or terrace, the use of *Kingspan OPTIM-R™ flex* boards are required to make up this difference. Each *Kingspan OPTIM-R™ flex* board is to be the same thickness as the *Kingspan OPTIM-R™* element of the Balcony & Terrace System.
- Both the *Kingspan OPTIM-R™* and *Kingspan OPTIM-R™ flex* elements of the Balcony & Terrace System should be bonded down using an appropriate proprietary adhesive system. For a loose laid ballasted system please contact the Kingspan Insulation Technical Service Department (see rear cover).
- At the perimeter of the balcony or terrace and where upstands or any other penetrations (e.g. drainage outlets) are present, *Kingspan OPTIM-R™ flex* should be laid abutting these areas, in strips no less than 200 mm wide, to take account of building tolerances and to provide a zone to allow for peel restraint mechanical fixing of the membrane should it be required. Refer to the waterproofing manufacturer for guidance on appropriate peel restraint detailing.
- The *Kingspan Thermaroof® TR27 LPC/FM* or *Kingspan Styrozone®* overlay should be laid as soon as possible to avoid exposure of the *Kingspan OPTIM-R™* element of the Balcony & Terrace System to direct foot traffic.
- The *Kingspan Thermaroof® TR27 LPC/FM* or *Kingspan Styrozone®* overlay should be bonded to the upper surface of the *Kingspan OPTIM-R™* and *Kingspan OPTIM-R™ flex* elements of the Balcony & Terrace System using an appropriate proprietary adhesive system prior to the application of the waterproof covering.
- Subject to project requirements, a minimum 25 mm thick *Kingspan Thermaroof® TR27 LPC/FM* or *Kingspan Styrozone®* upstand should be used around the perimeter of the balcony or terrace on the internal façade of parapets.
- Where upstands exist, a minimum distance of 300 mm should be maintained between the top of the insulation upstand and the bottom of the horizontal balcony or terrace insulation.
- The waterproofing membrane is installed in accordance with the membrane manufacturer's instructions, over the whole insulated area including any insulation upstands, as soon as possible after laying the insulation boards.

Installing over Plywood Decks

- Plywood decks should be clean, dry, without projections (including fixing heads etc.), steps or gaps, and should be graded to allow correct falls to all rainwater outlets.
- In order to ensure an adequate bond between the plywood deck and the vapour control layer, the plywood deck should be suitably primed, in accordance with the primer manufacturer's instructions, prior to the application of the adhesive system, used to bond the vapour control layer to the deck.
- Where one run of the specified vapour control layer laps another, there should be minimum 150 mm inside and end overlaps, which should be adequately sealed.
- Turn up the vapour control layer at the edge of the balcony or terrace to a height appropriate to the specified waterproofing membrane.
- An optional protection layer may be used under the *Kingspan OPTIM-R™ Balcony & Flooring System*. For further information please contact the Kingspan Insulation Technical Service Department (see rear cover).
- The *Kingspan OPTIM-R™* element of the Balcony & Terrace System should be laid chessboard pattern where practical, with joints lightly butted. There should be no gaps at abutments.
- Where runs of the *Kingspan OPTIM-R™* element of the Balcony & Terrace System do not accurately fit the dimension of the balcony or terrace, the use of *Kingspan OPTIM-R™ flex* boards are required to make up this difference. Each *Kingspan OPTIM-R™ flex* board is to be the same thickness as the *Kingspan OPTIM-R™* element of the Balcony & Terrace System.
- Both the *Kingspan OPTIM-R™* and *Kingspan OPTIM-R™ flex* elements of the Balcony & Terrace System should be bonded down using an appropriate proprietary adhesive system. For a loose laid ballasted system please contact the Kingspan Insulation Technical Service Department (see rear cover).
- At the perimeter of the balcony or terrace and where upstands or any other penetrations (e.g. drainage outlets) are present, *Kingspan OPTIM-R™ flex* should be laid abutting these areas, in strips no less than 200 mm wide, to take account of building tolerances and to provide a zone to allow for peel restraint mechanical fixing of the membrane should it be required. Refer to the waterproofing manufacturer for guidance on appropriate peel restraint detailing.

- The *Kingspan Thermaroof® TR27 LPC/FM* or *Kingspan Styrozone®* overlay should be laid as soon as possible to avoid exposure of the *Kingspan OPTIM-R™* element of the Balcony & Terrace System to direct foot traffic.
- The *Kingspan Thermaroof® TR27 LPC/FM* or *Kingspan Styrozone®* overlay should be bonded to the upper surface of the *Kingspan OPTIM-R™* and *Kingspan OPTIM-R™ flex* elements of the Balcony & Terrace System using an appropriate proprietary adhesive system prior to the application of the waterproof covering.
- Subject to project requirements, a minimum 25 mm thick *Kingspan Thermaroof® TR27 LPC/FM* or *Kingspan Styrozone®* upstand should be used around the perimeter of the balcony or terrace on the internal façade of parapets.
- Where upstands exist, a minimum distance of 300 mm should be maintained between the top of the insulation upstand and the bottom of the horizontal balcony or terrace insulation.
- The waterproofing membrane is installed in accordance with the membrane manufacturer's instructions, over the whole insulated area including any insulation upstands, as soon as possible after laying the insulation boards.

Installing over Existing Flat Roofs

- The *Kingspan OPTIM-R™ Balcony & Terrace System* is suitable for use over existing flat roofs. For further information please contact the Kingspan Insulation Technical Service Department (see rear cover).

Sitework

Wheeled / Foot Traffic

- The *Kingspan OPTIM-R™* element of the Balcony & Terrace System should not be walked on. A protective foot or crawl board should be used during the installation process.
- The *Kingspan OPTIM-R™ flex* element of the Balcony & Terrace System and the insulation overlay may be walked on.

General

- The *Kingspan OPTIM-R™* element of the Balcony & Terrace System should not be used in association with solvent-based adhesive systems.
- The *Kingspan OPTIM-R™* element of the Balcony & Terrace System should not be exposed to naked flames or excessive heat.

Cutting

- The *Kingspan OPTIM-R™* element of the Balcony & Terrace System should not be cut or penetrated.
- The substrate must be clean, dry and level, and free of sharp objects or edges.
- Cutting of *Kingspan OPTIM-R™ flex* should be carried out either by using a fine toothed saw, or by scoring with a sharp knife, snapping the board over a straight edge and then cutting the facing on the other side.
- Ensure accurate trimming of *Kingspan OPTIM-R™ flex* to achieve close-butting joints and continuity of insulation.

Availability

- Please contact Kingspan Insulation for availability of the *Kingspan OPTIM-R™ Balcony & Terrace System*.

Packaging and Storage

- The packaging of the *Kingspan OPTIM-R™ Balcony & Terrace System* should not be considered adequate for outdoor protection. The *Kingspan OPTIM-R™ Balcony & Terrace System* should be stored inside a building and raised off the floor.

Health and 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.

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 panel 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.

The reflective facing used on this product can be slippery underfoot when wet. Therefore, it is recommended that any excess material should be contained to avoid a slip hazard.

Product Details

Composition

The *Kingspan OPTIM-R*™ element of the Balcony & Terrace System comprises a rigid vacuum insulation panel with a microporous core which is evacuated, encased and sealed in a thin, gas-tight envelope.

The *Kingspan OPTIM-R*™ *flex* element of the Balcony & Terrace System comprises of a high performance rigid insulation faced on both sides with a coated glass tissue.

Standards and Approvals

The *Kingspan OPTIM-R*™ Balcony & Terrace System is manufactured to the highest standards under a management system certified to ISO 9001: 2008 (Quality Management Systems. Requirements), ISO 14001: 2004 (Environmental Management Systems. Requirements) and OHSAS 18001: 2007 (Health and Safety Management Systems. Requirements).

Standard Dimensions

The *Kingspan OPTIM-R*™ Balcony & Terrace System panels are available in the following standard size(s):

Nominal Dimension	Availability
Length (mm)	300 – 1200
Width (mm)	300 – 600
Insulant Thickness (mm)	20 – 60

Other sizes may be available dependent on order quantity. Please contact Kingspan Insulation for more details.

Compressive Strength

The compressive strength of the *Kingspan OPTIM-R*™ element of the Balcony & Terrace System typically exceeds 160 kPa at 10% compression when tested to BS / I.S. EN ISO 826: 1996 (Thermal insulating products for building application. Determination of compression behaviour).

Durability

If installed correctly and protected from damage and penetration, the *Kingspan OPTIM-R*™ Balcony & Terrace System will provide reliable long-term thermal performance over the lifetime of the building.

Resistance to Solvents, Fungi & Rodents

The *Kingspan OPTIM-R*™ Balcony & Terrace System should not be used in association with solvent-based adhesive systems. Damaged boards or boards that have been in contact with solvents or acids should not be used.

The insulation core and facings used in the manufacture of the *Kingspan OPTIM-R*™ Balcony & Terrace System resist attack by mould and microbial growth, and do not provide any food value to vermin.

Fire Performance

The *Kingspan OPTIM-R*™ Balcony & Terrace System, when subjected to the British Standard fire test, specified in the table below, will achieve the result shown, when waterproofed with a single-ply waterproofing membrane.

Test	Result
BS 476-3: 2004 (External fire exposure roof test)	Dependent on single-ply membrane adopted

Further 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 / I.S. EN 12667: 2001 (Thermal performance of building materials and products. Determination of thermal resistance by means of guarded hot plate and heat flow meter methods. Products of high and medium thermal resistance), with allowance for ageing and edge effect of the encapsulating film to form the design value.

Thermal Conductivity

The *Kingspan OPTIM-R*™ element of the Balcony & Terrace System achieves a thermal conductivity (λ -value) of 0.007 W/m·K (aged design value allowing for edge effect).

Thermal Resistance

Thermal resistance (R-value) of the *Kingspan OPTIM-R*™ element of the Balcony & Terrace System varies with thickness and is calculated by dividing the thickness of the panel (expressed in metres) by the thermal conductivity.

Insulant Thickness (mm)	Thermal Resistance (m ² ·K/W)
20	2.857
25	3.571
30	4.285
40	5.714
50	7.143
60	8.571

Contact Details

Customer Service

For quotations, order placement and details of despatches please contact the Kingspan Insulation Customer Service Department on the numbers below:

UK	- Tel:	+44 (0) 1544 388 601
	- Fax:	+44 (0) 1544 388 888
	- email:	customerservice@kingspaninsulation.co.uk
Ireland	- Tel:	+353 (0) 42 979 5000
	- Fax:	+353 (0) 42 975 4299
	- email:	info@kingspaninsulation.ie

Literature & Samples

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	- www.kingspaninsulation.co.uk/literature	
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Tapered Roofing

For technical guidance, quotations, order placement and details of despatches please contact the Kingspan Insulation Tapered Roofing Department on the numbers below:

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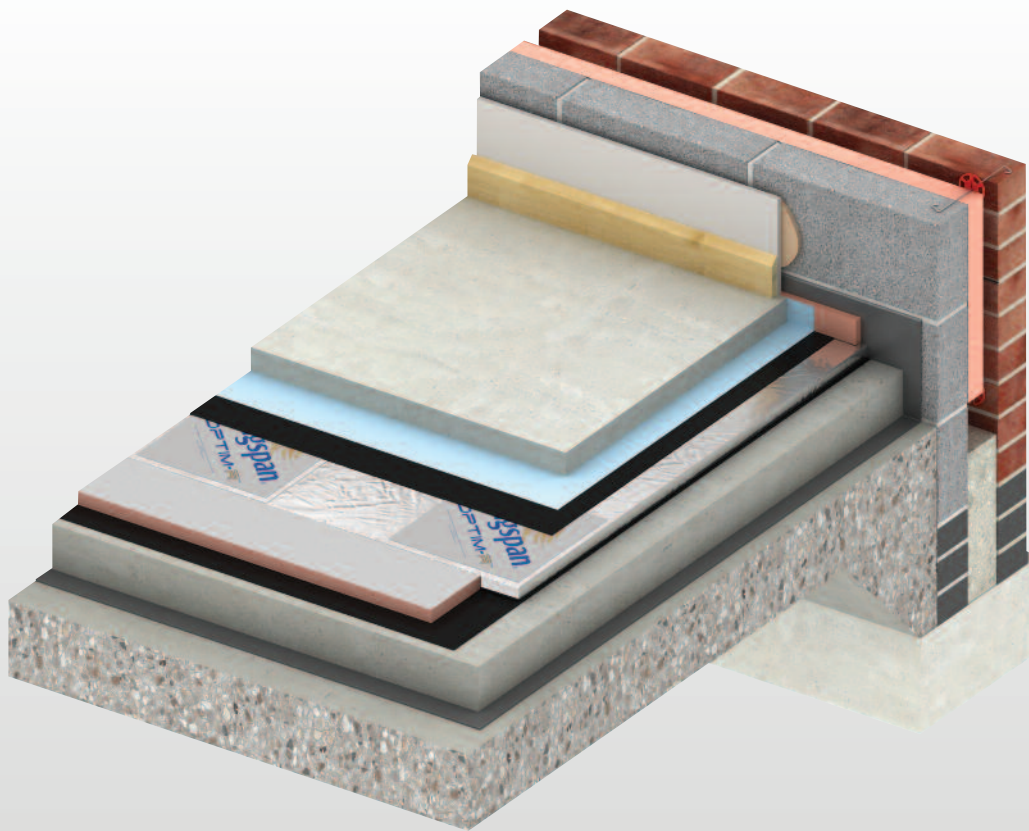
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OPTIM-R™ Flooring System

NEXT GENERATION INSULATION SOLUTION FOR FLOORS



- Optimum performance rigid vacuum insulation panel – aged design value thermal conductivity 0.007 W/m·K
- Insulating performance up to five times better than other commonly available insulation materials
- Ideal for constructions where a lack of construction depth or space is an issue
- Over 90% (by weight) recyclable
- Resistant to the passage of water vapour
- Ideal for new build and refurbishment
- Non-deleterious material



*Low Energy –
Low Carbon Buildings*

Introduction

The Problem

When constructing a floor in new build situations or replacing a floor in existing buildings there may be a requirement for both low U-values and the thinnest possible floor build-up.

For new-build applications, there are increasing regulatory requirements and economic reasons to improve energy efficiency. One of the approaches is to improve the thermal performance of the building fabric whilst keeping the overall construction as thin as possible. There are already high performance insulation products available that will fulfil the majority of these requirements, however in certain areas, for example where the design demands it, a new, thinner, product is needed.

In refurbishment there is arguably a greater need to keep floor build-ups as thin as possible. Space is already at a premium and there may be little space for installing new floor insulation. Greater thicknesses of floor insulation will necessitate the removal of a greater depth of material and may mean ground floor door lintels, radiators and skirting boards etc, all need to be raised. This could add to the cost and time of installing a replacement concrete floor.

The Solution

The *Kingspan OPTIM-R* Flooring System has been developed to help solve these problems. The *Kingspan OPTIM-R* Flooring System is an optimum performance next generation insulation solution from Kingspan Insulation. It comprises of rigid vacuum insulation panels with a microporous core which is evacuated, encased and sealed in a thin, gas-tight envelope, giving outstanding thermal conductivity, with the thinnest possible solution to insulation problems. The vacuum insulation panels are accompanied with rigid thermoset insulation infill panels which can be used where the remaining dimension to infill is below 300 mm or can be cut to fit around problem areas such as penetrations or load bearing walls.

In retrofit applications, the *Kingspan OPTIM-R* Flooring System provides solutions for areas that previously would have remained un-insulated because of insufficient space available or because the excavation of material is impractical. In new constructions the *Kingspan OPTIM-R* Flooring System can significantly enhance U-values in areas that would otherwise be accepted as denigrating the overall thermal performance.

With an aged design value thermal conductivity (λ) of 0.007 W/m·K, the *Kingspan OPTIM-R* element of the Flooring System provides an insulating performance that is up to five times better than other commonly available insulation materials.

Design Considerations

Design Service

The *Kingspan OPTIM-R* Flooring System comes with a supporting design service which ensures the ratio of the *Kingspan OPTIM-R* element of the Flooring System to the *Kingspan OPTIM-R* Flooring System infill panel for each project is maximised. The panel layout will be designed quickly and effectively, ready for client approval. Each layout will illustrate the size, number and location of the *Kingspan OPTIM-R* panels. It will also illustrate the size, number and location of any *Kingspan OPTIM-R* infill panels required.

Examples of a typical design layout can be seen in Figures 1 & 2.

For more details please contact the Kingspan Insulation Technical Service Department (see rear cover).

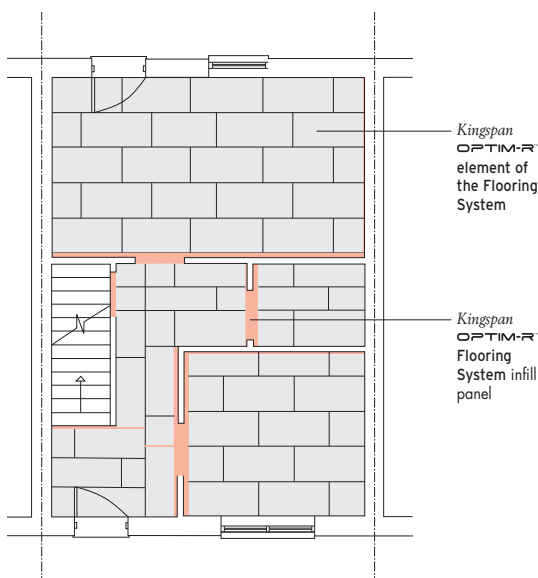


Figure 1: A typical terraced property with a solid concrete ground based floor

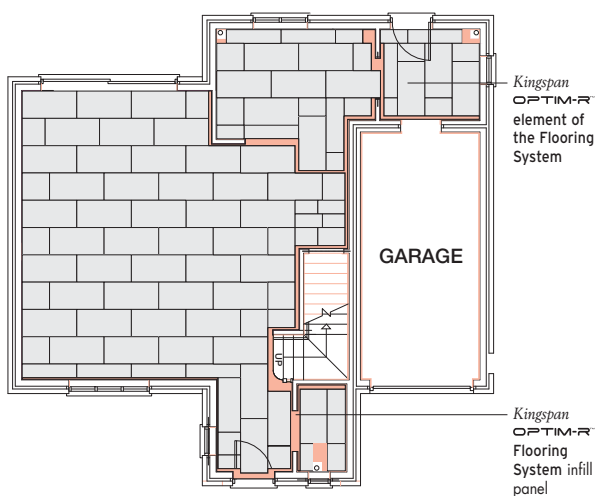


Figure 2: A typical property with a beam and dense block ground floor

Environmental Impact & Responsible Sourcing

Responsible Sourcing

The *Kingspan OPTIM-R™ Flooring System* is manufactured under a management system certified to EN ISO 14001: 2004.

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 is available at www.kingspaninsulation.co.uk/sustainabilityandresponsibility.

NBS Specifications

Details also available in NBS Plus. NBS users should refer to clause(s): M10 40, M10 290, M13 40 and M13 260.



Design Standards

Consideration should be given to the recommendations of BS 8102: 1990 (Code of practice for protection of buildings against water from the ground), BS 8215: 1991 (Code of practice for design and installation of damp proof courses in masonry construction), and the information given in Building Research Establishment Digest 104 (Floor Screeds).

Substrate

The *Kingspan OPTIM-R™ Flooring System* is not recommended for use in direct contact with subsoil and must be positioned above the DPM.

Lightning Protection

Building Designers should give consideration to the requirements of BS / IS EN 62305:2006 (Protection against lightning).

Underfloor Heating Systems

The typical constructions shown in Figures 3 and 4 can be readily converted to accommodate underfloor heating systems. For further information please contact the Kingspan Insulation Technical Service Department (see rear cover).

Typical Constructions and U-values

Assumptions

The U-values in the tables that follow have been calculated, under a management system certified to the BBA Scheme for Assessing the Competency of Persons to Undertake U-value and Condensation Risk Calculations, using the method detailed in BS / I.S. EN ISO 13370: 2007 (Thermal performance of buildings. Heat transfer via the ground. Calculation methods) and using the conventions set out in BR443 (Conventions for U-value calculations). They are valid for the constructions shown in the details immediately above each table.



Unlike roofs, walls and intermediate floors, U-value calculations for ground floors cannot be calculated with reference to the construction detail alone. Heat loss from ground floors depends upon the ratio of the exposed floor perimeter to the total floor area, the thickness of any basement wall and the depth of any basement.

Floor dimensions should be measured between the finished internal surfaces of the external walls. Non-usable heated space such as ducts and stairwells should be included when determining the area of the floor. Unheated spaces outside of the insulated fabric, such as attached garages or porches, should be excluded when determining the area of the floor, but the length of the wall between the heated building and the unheated space should be included when determining the perimeter. The floor dimensions of semi-detached, terraced or other joined premises / dwellings can be taken either as those of the premises / dwelling itself or those of the whole building. Where extensions to existing buildings are under consideration, the floor dimensions should be taken as those of the extension.

NB The figures quoted are for guidance only. A detailed U-value calculation should be completed for each individual project.

NB For the purposes of these calculations, using the method as detailed in BS / I.S. EN ISO 13370: 2007, the wall insulation is assumed to overlap the floor insulation by minimum 150 / 225 mm. The standard of workmanship has been assumed good and therefore the correction factor for air gaps has been ignored.*

NB To gain a comprehensive U-value calculation for your project please consult the Kingspan Insulation Technical Service Department for assistance (see rear cover).

** 150 mm applies to the UK and 225 mm to the Republic of Ireland.*

Typical Constructions and U-values

Solid Concrete Ground Based Floors

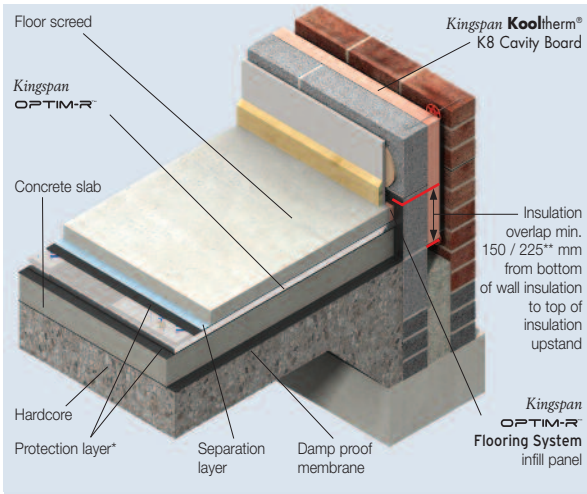


Figure 3

* Refer to Sitework

** 150 mm applies to the UK and 225 mm to the Republic of Ireland

Insulant Thickness (mm)	U-values (W/m ² -K)
20	0.20
25	0.17
30	0.16
40	0.13
50	0.11
30 + 30	0.09
30 + 40*	0.08
40 + 40	0.08

* Where multiple layers of insulation of different thicknesses are used, the thickest layer should be installed as the outermost layer in the construction.

The U-values above are based on the following assumptions:

Exposed floor perimeter	10.66 m
Floor area	35.985 m ²
P/A	0.296
Floor type	Solid ground floor
Earth conductivity	1.500 W/mK
Soil type	Clay or silt

For other constructions please contact the Kingspan Insulation Technical Service Department (see rear cover).

Beam and Dense Block Ground Floors

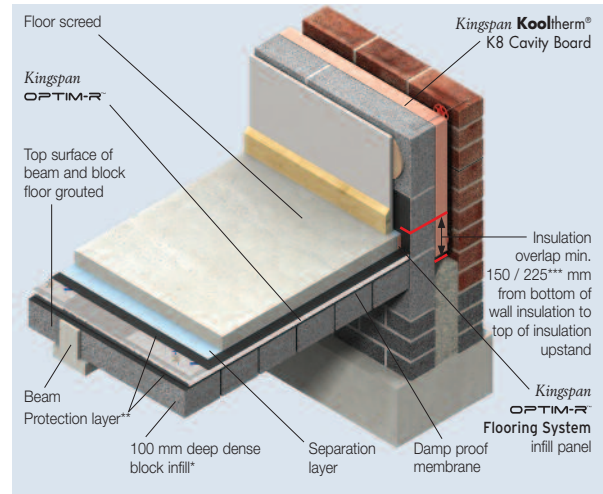


Figure 4

* Calculations assume dense block infill of λ -value (1.13 W/m-K)

** Refer to Sitework

*** 150 mm applies to the UK and 225 mm to the Republic of Ireland

Insulant Thickness (mm)	U-values (W/m ² -K)
20	0.25
25	0.20
30	0.18
40	0.15
50	0.13
30 + 30	0.11
30 + 40*	0.09
40 + 40	0.08

* Where multiple layers of insulation of different thicknesses are used, the thickest layer should be installed as the outermost layer in the construction.

The U-values above are based on the following assumptions:

Exposed floor perimeter	39.5 m
Floor area	56.39 m ²
P/A	0.70
Floor type	Suspended beam and dense block
Earth conductivity	1.500 W/mK
Soil type	Clay or silt

For other constructions please contact the Kingspan Insulation Technical Service Department (see rear cover).

Sitework

Installation Below a Floor Screed

- Concrete slabs should be allowed to dry out fully prior to the installation of the *Kingspan OPTIM-R™ Flooring System* (average 1 day per mm of slab thickness).
- The surface of the slab should be smooth, flat and free from projections. Thorough cleaning of the floor and removal of all projections is essential. Beam and block floors should be level and grouted.
- If a damp proof membrane (minimum 300 micron/1200 gauge polythene) is required, it should be laid with joints well lapped and folded, to prevent the passage of ground water, over the concrete slab or beam and block floor prior to laying the *Kingspan OPTIM-R™ Flooring System* panels.
- The membrane should be brought up the surrounding foundation walls until it is sufficiently above the height of the wall DPC so that it will connect with or form the DPC.
- An optional protection layer may be used under the *Kingspan OPTIM-R™ Flooring System*. For further information please contact the Kingspan Insulation Technical Service Department (see rear cover).
- The *Kingspan OPTIM-R™ Flooring System* panels should always be loose-laid, break bonded where practical, with all joints lightly butted.
- Starting at each external corner of the floor proceed to the lay the *Kingspan OPTIM-R™* element of the Flooring System across the floor area in a break bond pattern with all panel joints lightly butted. Where runs of the *Kingspan OPTIM-R™* element of the Flooring System do not accurately fit the dimension of the floor the use of *Kingspan OPTIM-R™ Flooring System* infill panels are required to make up this difference. It is envisaged that all *Kingspan OPTIM-R™ Flooring System* infill panels against an external wall should be in the centre of the run (please see example in Figure 1). Each *Kingspan OPTIM-R™ Flooring System* infill panel is to be the same thickness as the *Kingspan OPTIM-R™* element of the Flooring System.
- A strip of *Kingspan OPTIM-R™ Flooring System* infill panel (minimum 25mm thickness) should be placed vertically around the perimeter of the floor slab in order to reduce cold bridging. The top of the vertical strip of the *Kingspan OPTIM-R™ Flooring System* infill panel should be level with the top of the floor screed and the bottom should be level with the bottom of the horizontal floor insulation and closely butted up to it.
- An optional protection layer may also be used over the insulation. For further information please contact the Kingspan Insulation Technical Service Department (see rear cover).
- Insulation panels (both the *Kingspan OPTIM-R™* element of the Flooring System and any *Kingspan OPTIM-R™ Flooring System* infill panels used) should be overlaid with a separation layer (not less than 125 micron/500 gauge) to prevent the wet screed penetrating the joints between the boards. Ensure the separation layer has 150mm overlaps, taped at the joints and is turned up 100mm at the walls.
- Use sand and cement screed laid to a minimum thickness of 65mm for domestic constructions and 75mm in all other constructions.

Sitework

Wheeled / Foot Traffic

- The *Kingspan OPTIM-R™* Flooring System should not be walked on. A protective foot or crawl board should be used during the installation process.

General

- The *Kingspan OPTIM-R™* element of the Flooring System should not be used in association with solvent-based adhesive systems.
- The *Kingspan OPTIM-R™* element of the Flooring System should not be exposed to naked flames or excessive heat.

Cutting

- The *Kingspan OPTIM-R™* element of the Flooring System should not be cut or penetrated.
- The substrate must be clean, dry and level, and free of sharp objects or edges.
- Cutting of the *Kingspan OPTIM-R™* Flooring System infill panels should be carried out either by using a fine toothed saw, or by scoring with a sharp knife, snapping the board over a straight edge and then cutting the facing on the other side.
- Ensure accurate trimming of the *Kingspan OPTIM-R™* Flooring System infill panels to achieve close-butting joints and continuity of insulation.

Availability

- Please contact Kingspan Insulation for availability of the *Kingspan OPTIM-R™* Flooring System.

Packaging and Storage

- The packaging of the *Kingspan OPTIM-R™* Flooring System should not be considered adequate for outdoor protection. The *Kingspan OPTIM-R™* Flooring System should be stored inside a building and raised off the floor.

Health and 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.

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 panel 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.

The reflective facing used on this product can be slippery underfoot when wet. Therefore, it is recommended that any excess material should be contained to avoid a slip hazard.

Product Details

Composition

The *Kingspan OPTIM-R*™ element of the Flooring System comprises a rigid vacuum insulation panel with a microporous core which is evacuated, encased and sealed in a thin, gas-tight envelope.

The *Kingspan OPTIM-R*™ Flooring System infill panels comprise of a premium performance rigid thermoset modified resin insulant faced on both sides with a composite foil facing.

Standards and Approvals

The *Kingspan OPTIM-R*™ Flooring System is manufactured to the highest standards under a management system certified to ISO 9001: 2008 (Quality Management Systems. Requirements), ISO 14001: 2004 (Environmental Management Systems. Requirements) and OHSAS 18001: 2007 (Health and Safety Management Systems. Requirements).

Standard Dimensions

The *Kingspan OPTIM-R*™ Flooring System panels are available in the following standard size(s):

Nominal Dimension	Availability
Length (mm)	300 – 1200
Width (mm)	300 – 600
Insulant Thickness (mm)	20 – 40

Other sizes may be available dependent on order quantity. Please contact Kingspan Insulation for more details.

Compressive Strength

The compressive strength of the *Kingspan OPTIM-R*™ element of the Flooring System typically exceeds 160 kPa at 10% compression when tested to BS / I.S. EN ISO 826: 1996 (Thermal insulating products for building application. Determination of compression behaviour).

Durability

If installed correctly and protected from damage and penetration, the *Kingspan OPTIM-R*™ Flooring System can provide reliable long-term thermal performance over the lifetime of the building.

Resistance to Solvents, Fungi & Rodents

The *Kingspan OPTIM-R*™ Flooring System should not be used in association with solvent-based adhesive systems. Damaged boards or boards that have been in contact with solvents or acids should not be used.

The insulation core and facings used in the manufacture of the *Kingspan OPTIM-R*™ Flooring System resist attack by mould and microbial growth, and do not provide any food value to vermin.

Fire Performance

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 / I.S. EN 12667: 2001 (Thermal performance of building materials and products. Determination of thermal resistance by means of guarded hot plate and heat flow meter methods. Products of high and medium thermal resistance), with allowance for ageing and edge effect of the encapsulating film to form the design value.

Thermal Conductivity

The *Kingspan OPTIM-R*™ element of the Flooring System achieves a thermal conductivity (λ -value) of 0.007 W/m·K (aged design value allowing for edge effect).

Thermal Resistance

Thermal resistance (R-value) of the *Kingspan OPTIM-R*™ element of the Flooring System varies with thickness and is calculated by dividing the thickness of the panel (expressed in metres) by the thermal conductivity.

Insulant Thickness (mm)	Thermal Resistance (m ² ·K/W)
20	2.857
25	3.571
30	4.285
40	5.714

Contact Details

Customer Service

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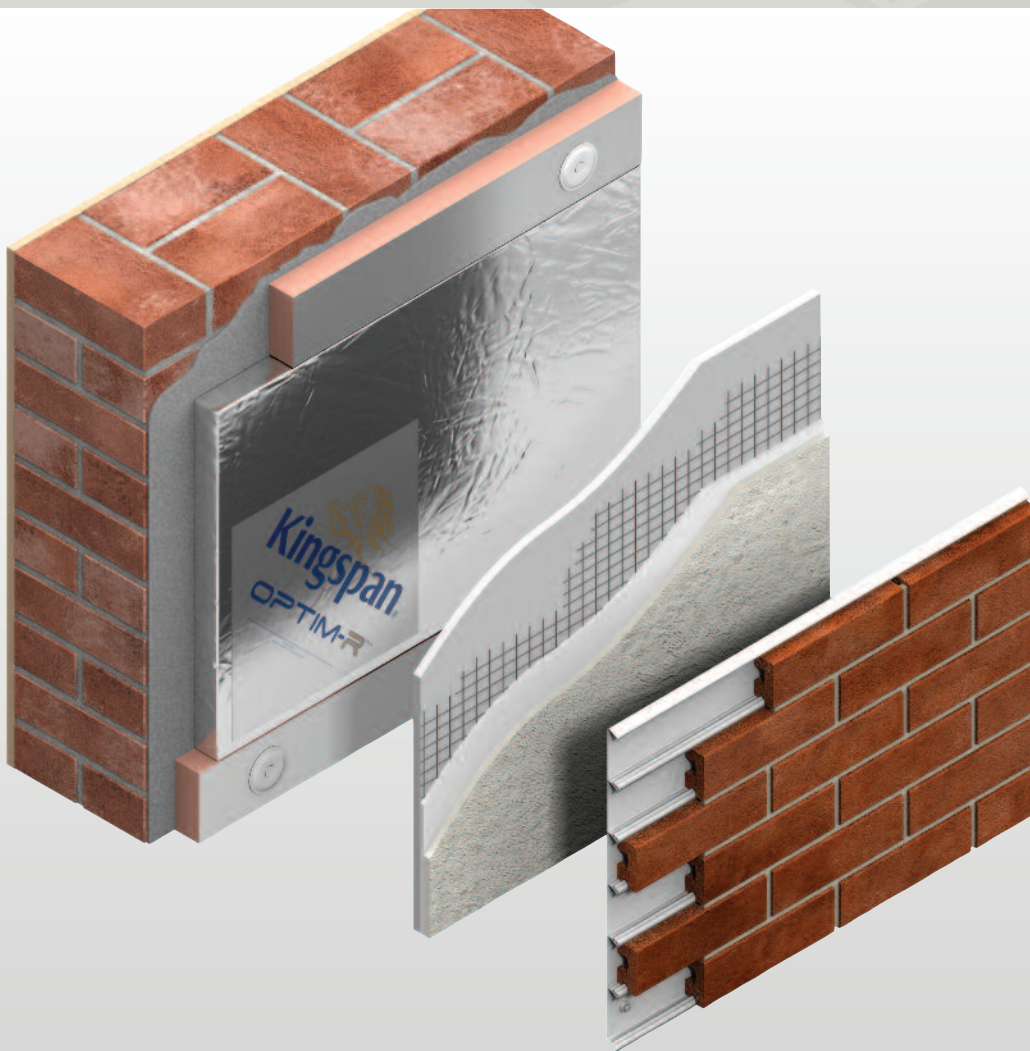
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OPTIM-R™ External Wall System

NEXT GENERATION INSULATION SOLUTION
FOR EXTERNAL MASONRY WALLS



- Optimum performance rigid vacuum insulation panel – aged design value thermal conductivity 0.007 W/m-K
- Insulating performance up to five times better than other commonly available insulation materials
- Ideal for constructions where a lack of construction depth or space is an issue
- Over 90% (by weight) recyclable
- Resistant to the passage of water vapour
- Ideal for new build and refurbishment
- Non-deleterious material



*Low Energy –
Low Carbon Buildings*

Introduction

The Problem

When constructing a wall in new build situations or upgrading the thermal performance of walls in existing buildings there may be a requirement for both low U-values and the thinnest possible wall build-up.

For new-build applications, there are increasing regulatory requirements and economic reasons to improve energy efficiency. One of the approaches is to improve the thermal performance of the building fabric whilst keeping the overall construction as thin as possible. There are already high performance insulation products available that will fulfil the majority of these requirements, however in certain areas, for example where the design demands it, a new, thinner, product is needed.

In refurbishment there is arguably a greater need to keep wall build-ups as thin as possible. Space is already at a premium and there may be little space for installing new external wall insulation for example because of the available depth of eaves overhangs, encroachment into access routes and the creation of unsightly steps between adjacent insulated and uninsulated walls. Greater thicknesses of external wall insulation could necessitate extending eaves, longer and more costly fixings, trims and accessories, and may result in greater reveal depths, reducing natural daylight.

The Solution

The **Kingspan OPTIM-R™ External Wall System** has been developed to help solve these problems. The **Kingspan OPTIM-R™ External Wall System** is an optimum performance next generation insulation solution from Kingspan Insulation. It comprises rigid vacuum insulation panels with a microporous core which is evacuated, encased and sealed in a thin, gas-tight envelope, giving outstanding thermal conductivity, with the thinnest possible solution to insulation problems. The vacuum insulation panels are accompanied by premium performance rigid insulation infill panels which can be cut to fit around penetrations, reveals and where fixtures and fittings need to be installed.

In retrofit applications, the **Kingspan OPTIM-R™ External Wall System** provides solutions for areas that previously could have remained un-insulated because of insufficient space available. In new constructions the **Kingspan OPTIM-R™ External Wall System** can significantly enhance U-values in areas that would otherwise be accepted as denigrating the overall thermal performance.

With an aged design value thermal conductivity (λ) of 0.007 W/m·K, the **Kingspan OPTIM-R™** element of the External Wall System provides an insulating performance that is up to five times better than other commonly available insulation materials.

Design Service

The **Kingspan OPTIM-R™ External Wall System** comprises 3 elements: **Kingspan OPTIM-R™** panels, **Kingspan OPTIM-R™ flex** infill panels and **Kingspan OPTIM-R™ fix** fixing panels. It comes with a supporting design service which ensures the ratio of the **Kingspan OPTIM-R™** element of the External Wall System to **Kingspan OPTIM-R™ flex** and **Kingspan OPTIM-R™ fix** for each project is maximised. The panel layout will be designed quickly and effectively, ready for client approval. Each layout will illustrate the size, number and location of the **Kingspan OPTIM-R™** panels. It will also illustrate the size, number and location of any **Kingspan OPTIM-R™ flex** and **Kingspan OPTIM-R™ fix** panels required.

Examples of a typical design layout can be seen in Figures 1 & 2.

For more details please contact the Kingspan Insulation Technical Service Department (see rear cover).

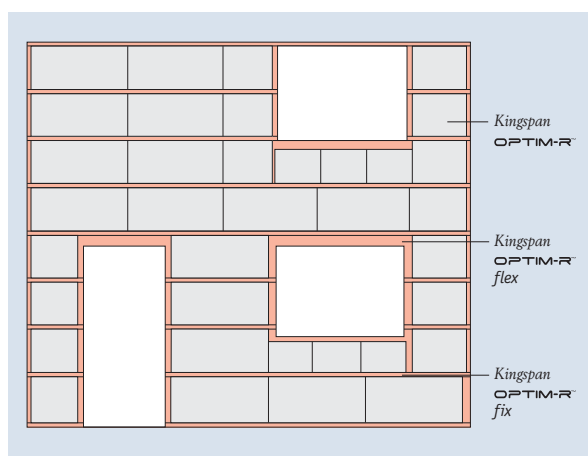


Figure 1: A typical terraced property ready for a render carrier board / brick slip finish

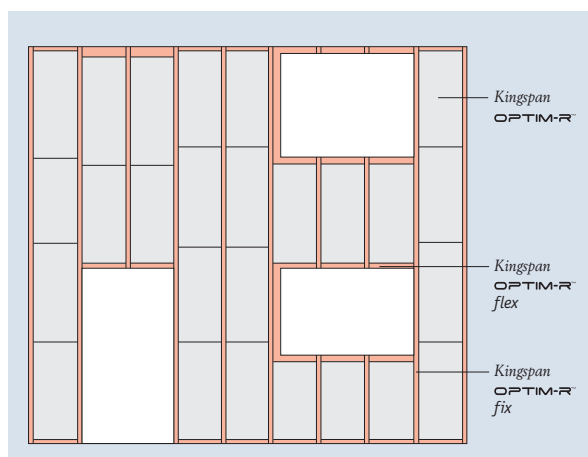


Figure 2: A typical property ready for a ventilated cladding finish

Typical Constructions and U-values

Assumptions

The U-values in the tables that follow have been calculated, under a management system certified to the BBA Scheme for Assessing the Competency of Persons to Undertake U-value and Condensation Risk Calculations, using the method detailed in BS / I.S. EN ISO 6946: 2007 (Building components and building elements. Thermal resistance and thermal transmittance. Calculation method), and using the conventions set out in BR443 (Conventions for U-value calculations). They are valid for the constructions shown in the details immediately above each table.

For the refurbishment examples, the internal wall finish is taken as 13 mm dense plaster unless stated otherwise. For the new build examples, the internal wall finish is taken to be a 3 mm skim coated 12.5 mm plasterboard on dabs, unless stated otherwise. In all examples, where the external wall finish is rendered, this is taken to be a 10 mm polymer render.

NB When calculating U-values to BS / I.S. EN ISO 6946: 2007, the type of mechanical fixing used may change the thickness of insulation required. These calculations assume the use of carbon steel fasteners of cross sectional area of 7.44 mm² at a density of 2.88 per m² for the 'render carrier board' or 'Brick Slips' options or 4.4 per m² for the 'Ventilated Cladding' options for fixing the external finishes to the appropriate horizontal or vertical Kingspan OPTIM-R[™] fix panels. The calculations also assume thermally broken fasteners with a thermal conductivity 1.00 W/m·K or less, the effect of which is insignificant, for the fixing of Kingspan OPTIM-R[™] fix and Kingspan OPTIM-R[™] flex.

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

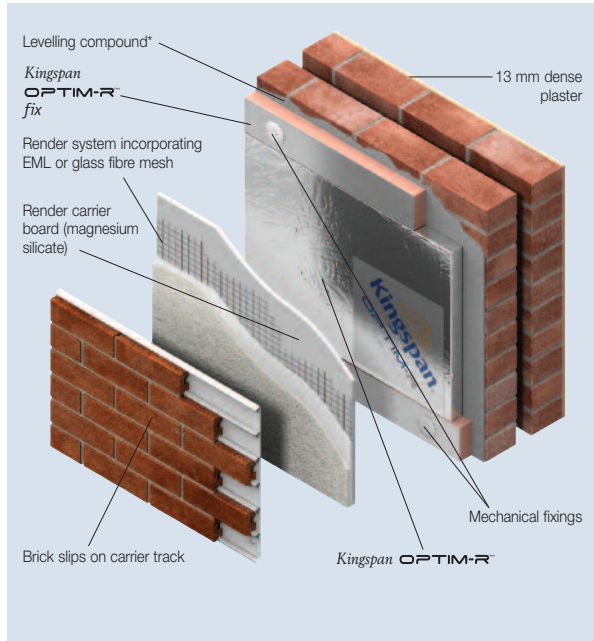
NB If your construction is different from those specified, and / or to gain a comprehensive U-value calculation along with a condensation risk analysis of your project, please consult the Kingspan Insulation Technical Service Department for assistance (see rear cover).

N.B. For the purposes of these calculations, the bridging effect of Kingspan OPTIM-R[™] fix and Kingspan OPTIM-R[™] flex has been taken to be 30%.



Refurbishment

100 mm Brick / 50 mm Cavity / 100 mm Brick Wall



* Refer to Sitework

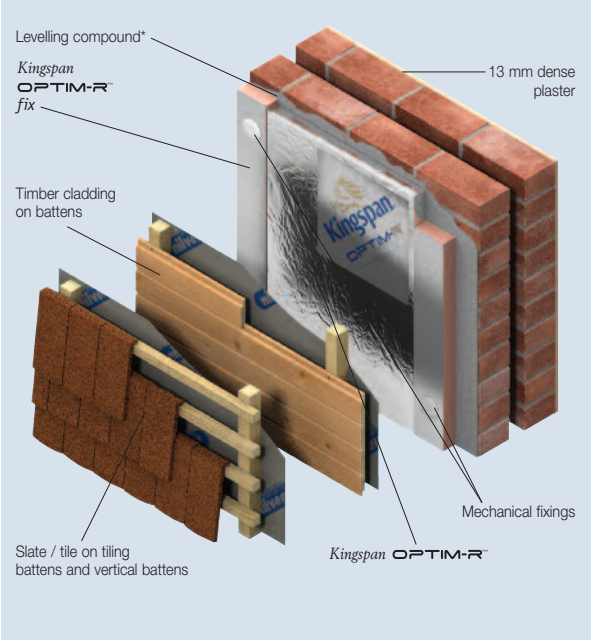
Figure 3

U-values for Various Thicknesses of Kingspan OPTIM-R[™] External Wall System with a 10 mm Polymer Render on Render Carrier Board or Brick Slips on a Carrier Track

Insulant Thickness (mm)	U-values (W/m ² ·K)
20	0.39
25	0.33
30	0.29
40	0.24
50	0.20
60	0.17
30 + 40	0.15

Typical Constructions and U-values

100 mm Brick / 50 mm Cavity / 100 mm Brick Wall

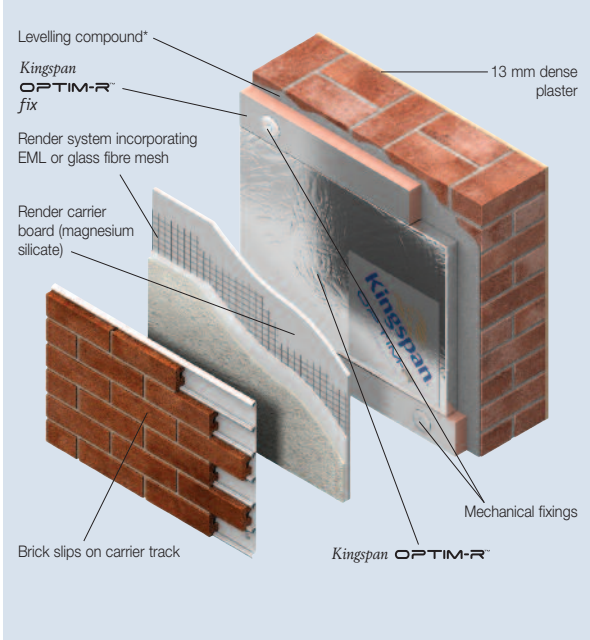


* Refer to Sitework

Figure 4

U-values for Various Thicknesses of <i>Kingspan OPTIM-R</i> ™ External Wall System with Ventilated Cladding e.g. Timber or Tile Hanging	
Insulant Thickness (mm)	U-values (W/m²·K)
20	0.40
25	0.34
30	0.29
40	0.24
50	0.20
60	0.17
30 + 40	0.15

Solid Brick Wall

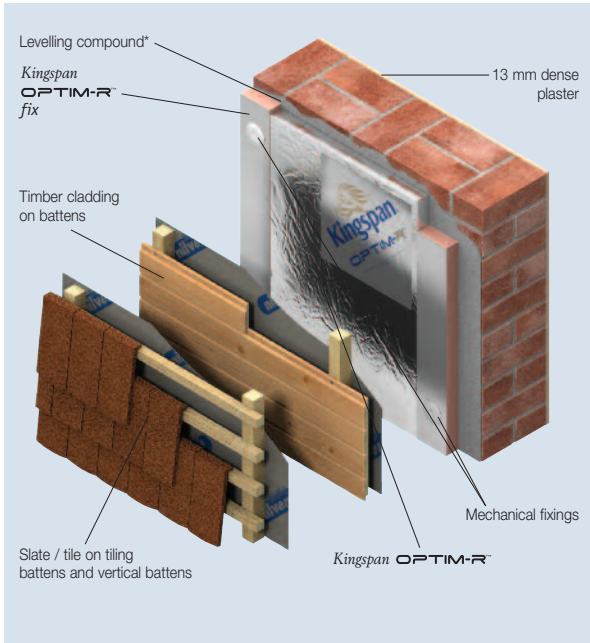


* Refer to Sitework

Figure 5

U-values (W/m²·K) for Various Thicknesses of the <i>Kingspan OPTIM-R</i> ™ System with a 10 mm Polymer Render on Render Carrier Board or Brick Slips on a Carrier Track		
Insulant Thickness (mm)	Brickwork Thickness (mm)	
	102.5	215
20	0.47	0.44
25	0.39	0.36
30	0.33	0.32
40	0.26	0.25
50	0.22	0.21
60	0.18	0.18
30 + 40	0.16	0.16

Solid Brick Wall



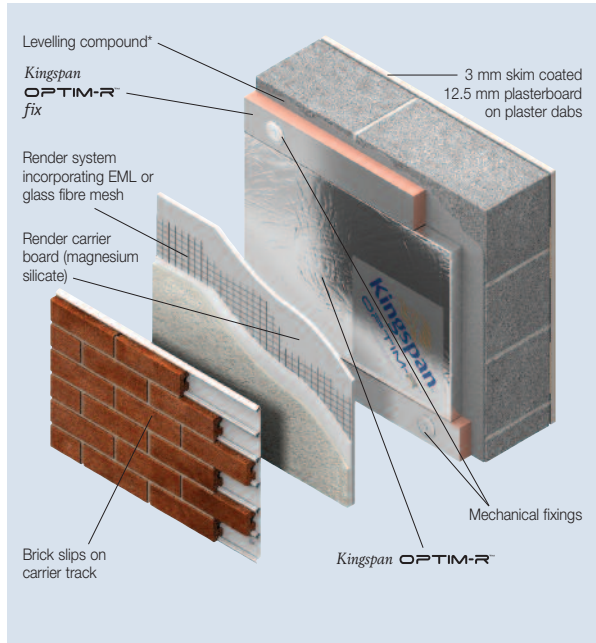
* Refer to Sitework

Figure 6

Insulant Thickness (mm)	Brickwork Thickness (mm)	
	102.5	215
20	0.48	0.44
25	0.39	0.37
30	0.34	0.32
40	0.27	0.25
50	0.22	0.21
60	0.19	0.18
30 + 40	0.16	0.16

New Build

215 mm Solid Blockwork Wall



* Refer to Sitework

Figure 7

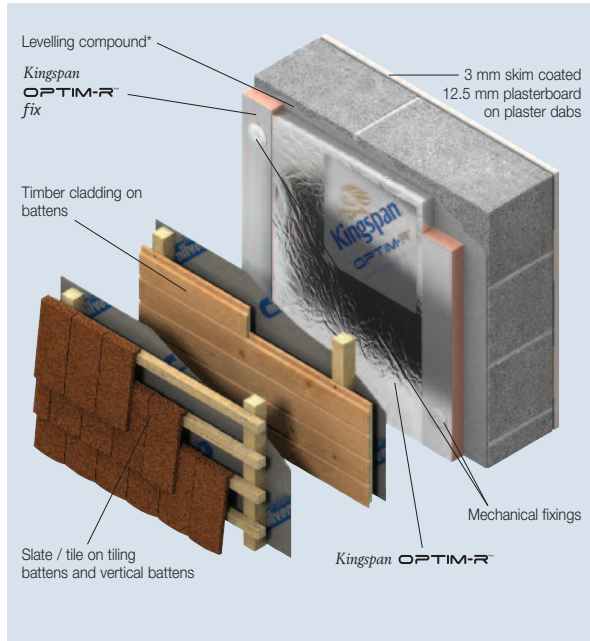
Insulant Thickness (mm)	Blockwork Density and λ -value (W/m·K)				
	Dense (1.13)	Medium (0.51)	Lightweight (0.15)*	Aerated (0.11)*	Thin Joint Aerated (0.11)**
20	0.42	0.38	0.28	0.25	0.25
25	0.35	0.32	0.24	0.22	0.22
30	0.30	0.28	0.23	0.20	0.20
40	0.24	0.23	0.19	0.18	0.17
50	0.20	0.19	0.16	0.15	0.15
60	0.21	0.17	0.14	0.14	0.13
30 + 40	0.15	0.15	0.13	0.12	0.12

* A 6.6% thermal bridging factor has been assumed for the effect of mortar joints.

** A 1.4% thermal bridging factor has been assumed for the effect of mortar joints.

Typical Constructions and U-values

215 mm Solid Blockwork Wall



* Refer to Sitework

Figure 8

Insulant Thickness (mm)	Blockwork Density and λ -value (W/m-K)				
	Dense (1.13)	Medium (0.51)	Lightweight (0.15)*	Aerated (0.11)*	Thin Joint Aerated (0.11)**
	20	0.42	0.38	0.28	0.26
25	0.35	0.32	0.25	0.23	0.22
30	0.31	0.29	0.23	0.20	0.20
40	0.25	0.23	0.19	0.18	0.18
50	0.20	0.19	0.16	0.15	0.15
60	0.18	0.17	0.14	0.14	0.13
30 + 40	0.15	0.15	0.13	0.12	0.12

* A 6.6% thermal bridging factor has been assumed for the effect of mortar joints.

** A 1.4% thermal bridging factor has been assumed for the effect of mortar joints.

Linear Thermal Bridging at Openings

Linear thermal bridging describes the heat loss at junctions between elements, where the geometry of the junction means that a building's primary insulation layer is not continuous or is reduced. This heat loss is represented by the junction's ψ value. The ψ -values of all the linear thermal bridges in a building are used in whole building carbon dioxide emissions calculation software.

At a window or door openings, in a wall insulated with the **Kingspan OPTIM-R External Wall System**, the linear thermal bridge is the reveal.

This linear thermal bridge can be avoided, by positioning the window frame so that its outer face is flush with the outer surface of the masonry wall, and overlapping the window frame with the external wall insulation.

If this is not possible, this linear thermal bridge can be reduced by insulating the reveal. The key factor is the thermal resistance (R-value) of this insulation layer.

Accredited Construction Details (England & Wales / Scotland / Northern Ireland) and Acceptable Construction Details (Republic of Ireland), collectively referred to here as ACDs, feature details for walls with external wall insulation, with reveals insulated with a material of minimum thermal resistance (R-value) of 0.60 m²-K/W. These constructions have the following ψ -values: 0.50 W/m-K for a steel lintel with a perforated steel base, 0.30 W/m-K for other lintels (including steel lintels), 0.04 W/m-K for a sill and 0.05 W/m-K for a jamb.

Adhering to these constructions, entitles a designer to use a default γ -value in whole building carbon dioxide emissions calculation software.

ACDs are specifically targeted at new build constructions but, where applicable, they are also considered best practice for refurbishment.

Reveals should be designed to accommodate the 20 mm of **Kingspan OPTIM-R flex** required to achieve an R-value of 0.6 m²-K/W, and the depth of the cladding system (see Figure 9).

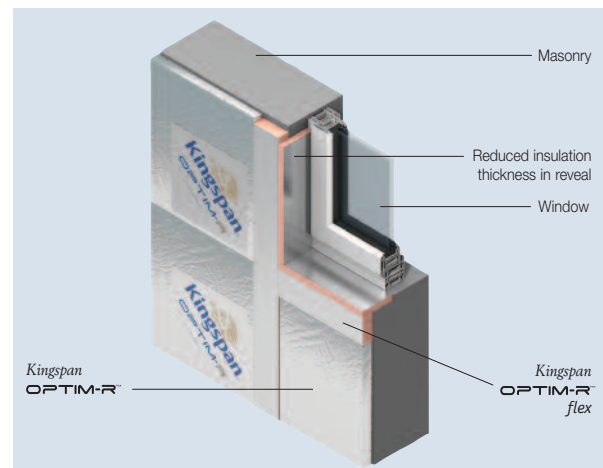


Figure 9

Design Considerations

Responsible Sourcing

Responsible Sourcing

The *Kingspan OPTIM-R™ External Wall System* is manufactured under a management system certified to EN ISO 14001: 2004.

Specification Clause

The *Kingspan OPTIM-R™* element of the External Wall System should be described in specifications as:-

The external wall insulation shall be the *Kingspan OPTIM-R™ External Wall System* ___ mm thick: comprising a rigid vacuum insulation panel with a microporous core which is evacuated, encased and sealed in a thin, gas-tight envelope. The product shall be manufactured under a management system certified to ISO 9001: 2008, ISO 14001: 2008 and OHSAS 18001: 2007, and installed in accordance with the instructions issued by Kingspan Insulation Limited.

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 is available at www.kingspaninsulation.co.uk/sustainabilityandresponsibility.

NBS Specifications

Details also available in NBS Plus.

NBS users should refer to clause(s):

M21 210, M21 220, M21 230

(Standard and Intermediate)

M21 20 (Minor Works)



Water Vapour Control / Condensation

Consideration should be given to the risk of condensation, when designing thermal elements.

A condensation risk analysis should be carried out following the procedures set out in BS 5250: 2002 (Code of practice for the control of condensation in buildings). The Kingspan Insulation Technical Service Department (see rear cover) can provide this service.

Fire Stops

Current Building Regulations / Standards should be considered with regard to the requirements for, and provision of, fire stops.

Sitework

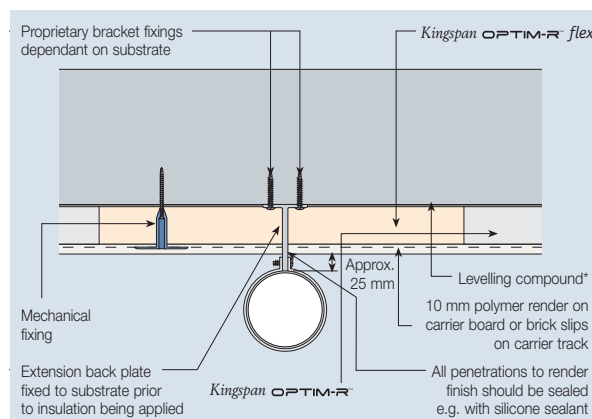
Insulated Render Systems

- Because insulated render systems are proprietary and utilise different mechanisms for attaching insulation to the wall structure, sitework guidance should be sought from the render system manufacturer. In the absence of any other guidance, the instructions laid out below may be followed.
- The external masonry wall should be clean, flat, and free from protrusions.
- Where an uneven surface remains, it is recommended that a levelling compound be applied.
- External wall insulation should start 150 / 200 / 600* mm below the top surface of the ground floor insulation / perimeter insulation upstand (whichever is higher) for a concrete floor, or 200 mm below the top surface of the ground floor insulation / perimeter insulation upstand (whichever is higher) for a suspended timber floor.

* 150 mm applies to the UK, 200 mm applies to the Republic of Ireland if a row of insulating blockwork (thermal conductivity < 0.20 W/m·K) is used, otherwise 600 mm applies.

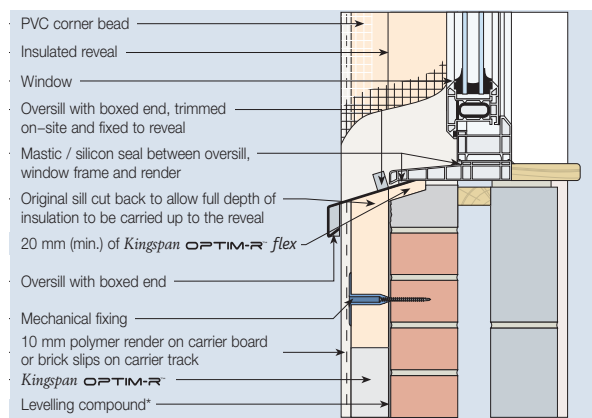
- **Kingspan OPTIM-R™ fix**, minimum 100 mm wide, should be installed horizontally at maximum 600 mm vertical centres, in order to provide a fixing point for the subsequent attachment of the render carrier board which will accept the render finish or the carrier track which will accept the brick slip system. **Kingspan OPTIM-R™ fix** should be of the same thickness as the specified **Kingspan OPTIM-R™** element of the External Wall System. **Kingspan OPTIM-R™ fix** should be mechanically fixed back to the substrate using
- The **Kingspan OPTIM-R™** element of the **External Wall System** should be installed between **Kingspan OPTIM-R™ fix** with board edges lightly butted. Remaining areas of wall around openings and other details which can not be insulated with the **Kingspan OPTIM-R™** element of the External Wall System should be in-filled with an equal thickness of **Kingspan OPTIM-R™ flex**.
- The **Kingspan OPTIM-R™** element of the External Wall System should be restrained to the substrate using a suitable proprietary adhesive. For further advice on the specification of the proprietary adhesive and application guidance please contact the Kingspan Insulation Technical Services Department.
- **Kingspan OPTIM-R™ flex** should be mechanically fixed back to the substrate using appropriate mechanical fasteners, preferably thermally.
- Care should be taken to install the specified thickness of insulation around reveals (see Figure 9).
- Once the **Kingspan OPTIM-R™**, **Kingspan OPTIM-R™ fix** and **Kingspan OPTIM-R™ flex** have been installed, a render carrier board is installed in a continuous layer over the assembly and fixed back to the substrate through the horizontal **Kingspan OPTIM-R™ fix** in order to accept the render finish. Alternatively a carrier track can be installed to accept a brick slip finish.

- When selecting the type of fixing and fixing frequency, consideration must be given to the weight of the cladding, the design of the wall and wind loading. For details on suitable fixings please consult the appropriate fixing and cladding manufacturer. Care must be taken to ensure fasteners do not penetrate the **Kingspan OPTIM-R™** element of the External Wall System.
- Wherever possible, care should be taken to avoid cold bridging when attaching services and ancillaries to the exterior of the building (see Figure 10).
- Depending on the render finish being applied, advice must be sought from the render manufacturer on the EML / glass fibre mesh and bedding mortar to be applied.
- In refurbishment projects, sill extenders and flashings should be used around openings, with care taken to avoid cold bridging (see Figure 11).



* Refer to Sitework

Figure 10 – Drainpipe Extension Detail (Applicable to a Variety of External Building Ancillaries)



* Refer to Sitework

Figure 11 – Oversill Extension Detail (Refurbishment)

Ventilated Cladding Systems

- The external masonry wall should be clean, flat, and free from protrusions. Where an uneven surface remains, it is recommended that a levelling compound be applied.
- External wall insulation should start 150 / 200 / 600* mm below the top surface of the ground floor insulation / perimeter insulation upstand (whichever is higher) for a concrete floor, or 200 mm below the top surface of the ground floor insulation / perimeter insulation upstand (whichever is higher) for a suspended timber floor.
* 150 mm applies to the UK. 200 mm applies to the Republic of Ireland if a row of insulating blockwork (thermal conductivity < 0.20 W/m·K) is used, otherwise 600 mm applies.
- *Kingspan OPTIM-R™ fix*, minimum 100 mm wide, should be installed vertically at maximum 600 mm horizontal centres, in order to provide a fixing point for the subsequent attachment of the timber battens which will accept the ventilated cladding system. Strips should be of the same thickness as the specified *Kingspan OPTIM-R™* element of the External Wall System. *Kingspan OPTIM-R™ fix* should be mechanically fixed back to the substrate using appropriate mechanical fasteners, preferably thermally broken.
- The *Kingspan OPTIM-R™* element of the External Wall System should be installed between the *Kingspan OPTIM-R™ fix* with board edges lightly butted. Remaining areas of wall around openings and other details which can not be insulated with the *Kingspan OPTIM-R™* element of the External Wall System should be in-filled with an equal thickness of *Kingspan OPTIM-R™ flex*.
- The *Kingspan OPTIM-R™* element of the External Wall System should be restrained to the substrate using a suitable proprietary adhesive. For further advice on the specification of the proprietary adhesive and application guidance please consult the Kingspan Insulation Technical Services Department for assistance.
- *Kingspan OPTIM-R™ flex* should be mechanically fixed back to the substrate, using appropriate mechanical fasteners, preferably thermally broken.
- Care should be taken to install the specified thickness of insulation around reveals (see Figure 9).
- Once the *Kingspan OPTIM-R™*, *Kingspan OPTIM-R™ fix* and *Kingspan OPTIM-R™ flex* have been installed, a breathable membrane, e.g. *Kingspan nilvent®*, is installed over the System and temporarily stapled or pinned in place to the vertical *Kingspan OPTIM-R™ fix*.
- Minimum 38 mm x 38 mm vertical treated softwood timber battens are fixed through the breathable membrane and the installed *Kingspan OPTIM-R™ fix* vertical to the substrate behind. Care must be taken to ensure fasteners do not penetrate the *Kingspan OPTIM-R™* element of the External Wall System.
- When selecting the type of fixing and fixing frequency for the vertical battens, consideration must be given to the weight of cladding to be fixed to them, the design of the wall, and wind loading. For details on suitable fixings, please consult the appropriate fixing and cladding manufacturer.
- If the cladding system is to be tile / slate hanging, horizontal tiling battens can then be fixed to the vertical battens.
- Horizontal tiling battens and the tile / slate cladding that is to be fixed to them should be installed in accordance with the tile / slate cladding manufacturers recommendations.
- Alternatively, timber cladding can be fixed directly to the vertical battens.
- If the cladding system is to be finished with render, the render carrier board (e.g. magnesium silicate building board, expanded metal lath) can be fixed directly to the vertical battens.
- The dry cladding system should be secured in accordance with the manufacturer's recommendations.
- Wherever possible, care should be taken to avoid cold bridging when attaching services and ancillaries to the exterior of the building.
- In refurbishment projects, sill extenders and flashings should be used around openings, with care taken to avoid cold bridging.

Sitework

General

- The *Kingspan OPTIM-R*™ element of the External Wall System should not be used in association with solvent-based adhesive systems. The *Kingspan OPTIM-R*™ element of the External Wall System should not be exposed to naked flames or excessive heat.

Cutting

- The *Kingspan OPTIM-R*™ element of the External Wall System should not be cut or penetrated. The substrate must be clean, dry and level, and free of sharp objects or edges.
- Cutting of the *Kingspan OPTIM-R*™ *fix* and *Kingspan OPTIM-R*™ *flex* should be carried out either by using a fine toothed saw, or by scoring with a sharp knife, snapping the board over a straight edge and then cutting the facing on the other side.
- Ensure accurate trimming of the *Kingspan OPTIM-R*™ *fix* and *Kingspan OPTIM-R*™ *flex* to achieve close-butting joints and continuity of insulation.

Availability

- Please contact Kingspan Insulation for availability of the *Kingspan OPTIM-R*™ External Wall System.

Packaging and Storage

- The packaging of the *Kingspan OPTIM-R*™ External Wall System should not be considered adequate for outdoor protection. The *Kingspan OPTIM-R*™ External Wall System should be stored inside a building and raised off the floor.

Health and 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.

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 panel 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.

Product Details

Composition

The *Kingspan OPTIM-R*™ element of the External Wall System comprises a rigid vacuum insulation panel with a microporous core which is evacuated, encased and sealed in a thin, gas-tight envelope.

Kingspan OPTIM-R™ *fix* and *Kingspan OPTIM-R*™ *flex* comprises a premium performance rigid insulation faced on both sides with a composite foil facing.

Standards and Approvals

The *Kingspan OPTIM-R*™ External Wall System is manufactured to the highest standards under a management system certified to ISO 9001: 2008 (Quality Management Systems. Requirements), ISO 14001: 2004 (Environmental Management Systems. Requirements) and OHSAS 18001: 2007 (Health and Safety Management Systems. Requirements).

Standard Dimensions

The *Kingspan OPTIM-R*™ External Wall System panels are available in the following standard size(s):

Nominal Dimension	Availability
Length (mm)	300 – 1200
Width (mm)	300 – 600
Insulant Thickness (mm)	20 – 60

Other sizes may be available dependent on order quantity. Please contact Kingspan Insulation for more details.

Compressive Strength

The compressive strength of the *Kingspan OPTIM-R*™ element of the External Wall System typically exceeds 160 kPa at 10% compression when tested to BS / I.S. EN ISO 826: 1996 (Thermal insulating products for building application. Determination of compression behaviour).

Durability

If installed correctly and protected from damage and penetration, the *Kingspan OPTIM-R*™ External Wall System can provide reliable long-term thermal performance over the lifetime of the building.

Resistance to Solvents, Fungi & Rodents

The *Kingspan OPTIM-R*™ External Wall System should not be used in association with solvent-based adhesive systems. Damaged boards or boards that have been in contact with solvents or acids should not be used.

The insulation core and facings used in the manufacture of the *Kingspan OPTIM-R*™ External Wall System resist attack by mould and microbial growth, and do not provide any food value to vermin.

Fire Performance

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 / I.S. EN 12667: 2001 (Thermal performance of building materials and products. Determination of thermal resistance by means of guarded hot plate and heat flow meter methods. Products of high and medium thermal resistance), with allowance for ageing and edge effect of the encapsulating film to form the design value.

Thermal Conductivity

The *Kingspan OPTIM-R*™ element of the External Wall System achieves a thermal conductivity (λ -value) of 0.007 W/m·K (aged design value allowing for edge effect).

Thermal Resistance

Thermal resistance (R-value) of the *Kingspan OPTIM-R*™ element of the Flooring System varies with thickness and is calculated by dividing the thickness of the panel (expressed in metres) by the thermal conductivity.

Insulant Thickness (mm)	Thermal Resistance (m ² ·K/W)
20	2.857
25	3.571
30	4.285
40	5.714
50	7.143
60	8.571

Contact Details

Customer Service

For quotations, order placement and details of despatches please contact the Kingspan Insulation Customer Service Department on the numbers below:

UK	- Tel:	+44 (0) 1544 388 601
	- Fax:	+44 (0) 1544 388 888
	- email:	customerservice@kingspaninsulation.co.uk
Ireland	- Tel:	+353 (0) 42 979 5000
	- Fax:	+353 (0) 42 975 4299
	- email:	info@kingspaninsulation.ie

Literature & 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 or as individual product brochures, Kingspan Insulation technical literature is an essential specification tool. For copies please contact the Kingspan Insulation Marketing Department, or visit the Kingspan Insulation website, using the details below:

UK	- Tel:	+44 (0) 1544 387 384
	- Fax:	+44 (0) 1544 387 484
	- email:	literature@kingspaninsulation.co.uk
	- www.kingspaninsulation.co.uk/literature	
Ireland	- Tel:	+353 (0) 42 979 5000
	- Fax:	+353 (0) 42 975 4299
	- email:	info@kingspaninsulation.ie
	- www.kingspaninsulation.ie/literature	

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	- Tel:	+44 (0) 1544 387 383
	- Fax:	+44 (0) 1544 387 483
	- email:	tapered@kingspaninsulation.co.uk
Ireland	- Tel:	+353 (0) 42 975 4297
	- Fax:	+353 (0) 42 975 4296
	- email:	tapered@kingspaninsulation.ie

Technical Advice / Design

Kingspan Insulation supports all of its 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 Technical Service Department 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 Service Department can also give general application advice and advice on design detailing and fixing etc... Site surveys are also undertaken as appropriate.

The Kingspan Insulation British Technical Service Department operates under a management system certified to the BBA Scheme for Assessing the Competency of Persons to Undertake U-value and Condensation Risk Calculations.



Please contact the Kingspan Insulation Technical Service Department on the numbers below:

UK	- Tel:	+44 (0) 1544 387 382
	- Fax:	+44 (0) 1544 387 482
	- email:	technical@kingspaninsulation.co.uk
Ireland	- Tel:	+353 (0) 42 975 4297
	- Fax:	+353 (0) 42 975 4296
	- email:	technical@kingspaninsulation.ie

General Enquiries

For all other enquiries contact Kingspan Insulation on the numbers below:

UK	- Tel:	+44 (0) 1544 388 601
	- Fax:	+44 (0) 1544 388 888
	- email:	info@kingspaninsulation.co.uk
Ireland	- Tel:	+353 (0) 42 979 5000
	- Fax:	+353 (0) 42 975 4299
	- email:	info@kingspaninsulation.ie

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Kingspan Insulation Ltd is a member of:

The Insulated Render and Cladding Association (INCA)

The National Insulation Association (NIA)



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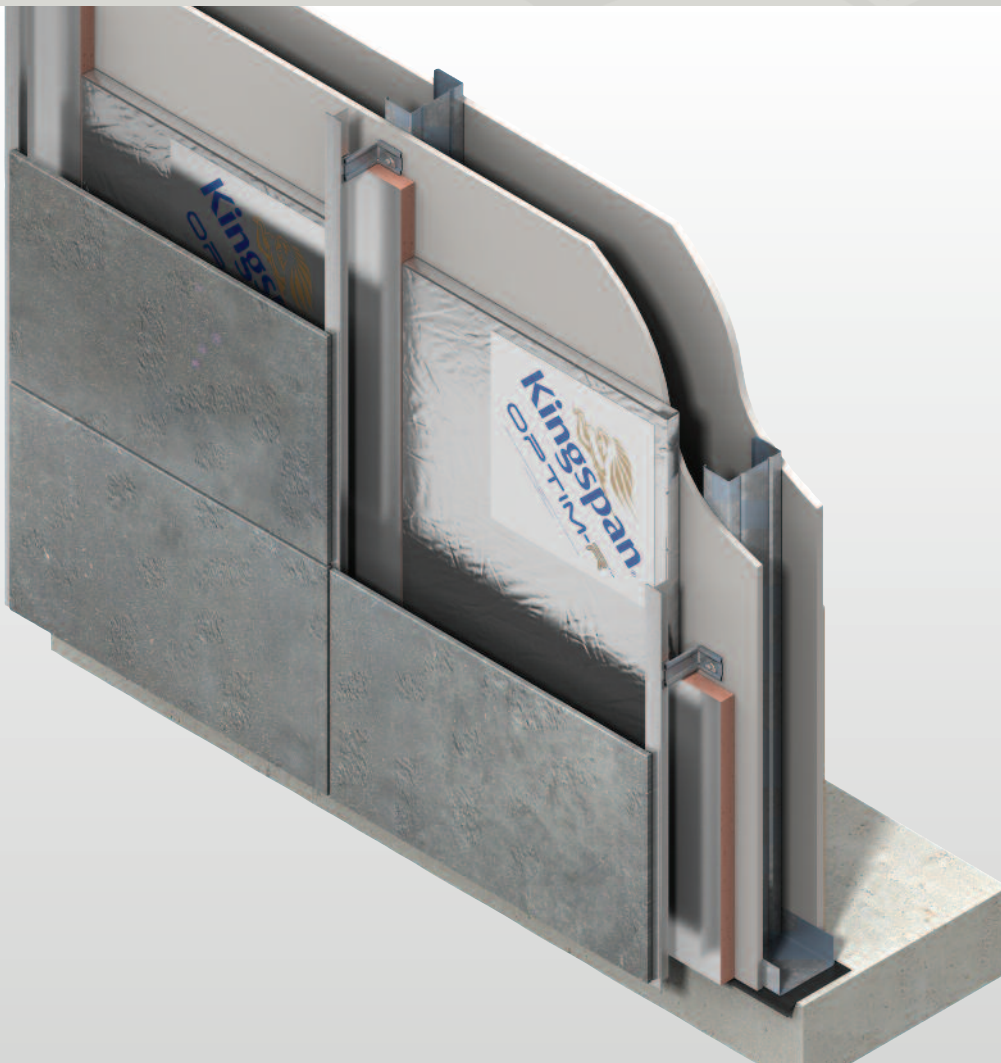
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Registered in Ireland, No. 152775. Registered Office: Bree Industrial Estate, Castleblayney, Co. Monaghan, Ireland. VAT IE6550175J.



OPTIM-R™ Rainscreen System

NEXT GENERATION INSULATION SOLUTION FOR
RAINSCREEN CLADDING SYSTEMS



- Optimum performance rigid vacuum insulation panel – aged design value thermal conductivity 0.007 W/m-K
- Insulating performance up to five times better than other commonly available insulation materials
- Ideal for constructions where a lack of construction depth or space is an issue
- Over 90% (by weight) recyclable
- Resistant to the passage of water vapour
- Ideal for new build and refurbishment
- Non-deleterious material



*Low Energy –
Low Carbon Buildings*

Introduction

The Problem

When constructing a rainscreen wall in new build situations or upgrading the thermal performance of walls in existing buildings there may be a requirement for both low U-values and the thinnest possible wall build-up.

For new-build applications, there are increasing regulatory requirements and economic reasons to improve energy efficiency. One of the approaches is to improve the thermal performance of the building fabric whilst keeping the overall construction as thin as possible. There are already high performance insulation products available that will fulfil the majority of these requirements, however in certain areas, for example where the design demands it, a new, thinner, product is needed.

In refurbishment there is arguably a greater need to keep wall build-ups as thin as possible. Space is already at a premium and there may be little space for installing new rainscreen cladding for example because of the available depth of eaves overhangs and encroachment into access routes. Deeper rainscreen cladding systems could necessitate extending eaves, longer and more costly fixings, trims and accessories, and may result in greater reveal depths, reducing natural daylight.

The Solution

The *Kingspan OPTIM-R™ Rainscreen System* has been developed to help solve these problems. The *Kingspan OPTIM-R™ Rainscreen System* is an optimum performance next generation insulation solution from Kingspan Insulation. It comprises of rigid vacuum insulation panels with a microporous core which is evacuated, encased and sealed in a thin, gas-tight envelope, giving outstanding thermal conductivity, with the thinnest possible solution to insulation problems. The vacuum insulation panels are accompanied by premium performance rigid insulation infill panels which can be cut to fit around penetrations, brackets, reveals and where fixtures and fittings need to be installed.

In retrofit applications, the *Kingspan OPTIM-R™ Rainscreen System* provides solutions for areas that previously could have remained un-insulated because of insufficient space available. In new constructions the *Kingspan OPTIM-R™ Rainscreen System* can significantly enhance U-values in areas that would otherwise be accepted as denigrating the overall thermal performance.

With an aged design value thermal conductivity (λ) of 0.007 W/m·K, the *Kingspan OPTIM-R™* element of the Rainscreen System provides an insulating performance that is up to five times better than other commonly available insulation materials.

Design Service

The *Kingspan OPTIM-R™ Rainscreen System* comprises 2 elements: *Kingspan OPTIM-R™* panels and *Kingspan OPTIM-R™ flex* infill panels. It comes with a supporting design service which ensures the ratio of the *Kingspan OPTIM-R™* element of the Rainscreen System to *Kingspan OPTIM-R™ flex* for each project is maximised. The panel layout will be designed quickly and effectively, ready for client approval. Each layout will illustrate the size, number and location of the *Kingspan OPTIM-R™* panels. It will also illustrate the size, number and location of any *Kingspan OPTIM-R™ flex* required. The thermal bridging effect of *Kingspan OPTIM-R™ flex* will also be calculated.

For more details please contact the Kingspan Insulation Technical Service Department (see rear cover).

Typical Constructions and U-values

Assumptions

Because rainscreen systems are proprietary and utilise different mechanisms for attaching cladding panels to the wall structure, it is advisable to contact the Kingspan Insulation Technical Service Department (see rear cover) for specific U-value calculations.

The U-values in the tables that follow have been calculated using the methods detailed in BS / I.S. EN ISO 6946: 2007. (Building components and building elements. Thermal resistance and thermal transmittance. Calculation method) and using the conventions set out in BR443 (Conventions for U-value calculations). They are valid for the constructions shown in the details immediately above each table.

For the structural masonry wall examples, the internal wall finish is taken as a 3 mm skim coated 12.5 mm plasterboard on dabs, with the structural masonry wall at 200 mm. For the steel frame examples, the internal wall finish is taken to be a 3 mm skim coated 12.5 mm plasterboard, with the calcium silicate board at 9 mm.

NB When calculating U-values to BS / I.S. EN ISO 6946: 2007, the type of discrete 'helping hand' bracket used may change the thickness of insulation required. Please contact the Kingspan Insulation Technical Service Department for assistance (see rear cover).

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 should be completed for each individual project.

NB To gain a comprehensive U-value calculation for your project please consult the Kingspan Insulation Technical Service Department for assistance (see rear cover).

NB For the purposes of these calculations, the bridging effect of Kingspan OPTIM-R flex has been taken to be 30%.

Insulated Rainscreen Cladding Systems (terracotta clay tile external finish)

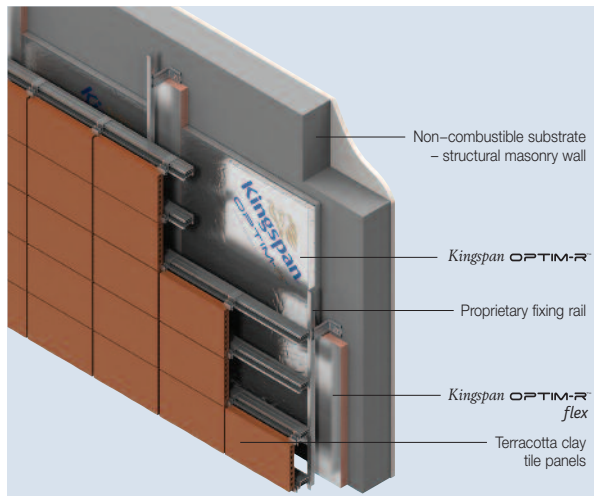


Figure 1

Insulant Thickness (mm)	U-values (W/m ² ·K)
40	0.28
50	0.24
60	0.22
30 + 40	0.20
40 + 40	0.18
40 + 50	0.17
50 + 50	0.16

Insulated Rainscreen Cladding Systems on Steel Frame

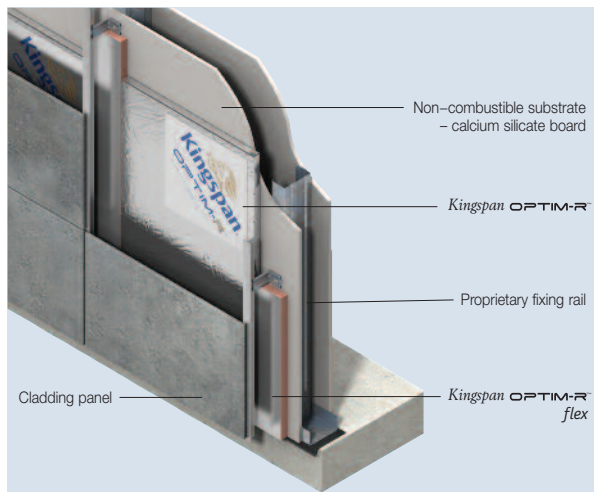


Figure 2

Insulant Thickness (mm)	U-values (W/m ² ·K)
40	0.32
50	0.27
60	0.24
30 + 40	0.22
40 + 40	0.20
40 + 50	0.19
50 + 50	0.18

Design Considerations

Responsible Sourcing

Responsible Sourcing

The *Kingspan OPTIM-R™ Rainscreen System* is manufactured under a management system certified to EN ISO 14001: 2004.

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 is available at www.kingspaninsulation.co.uk/sustainabilityandresponsibility.

Specification Clause

The *Kingspan OPTIM-R™* element of the Rainscreen System should be described in specifications as:-

The wall insulation shall be the *Kingspan OPTIM-R™ Rainscreen System* ___ mm thick: comprising a rigid vacuum insulation panel with a microporous core which is evacuated, encased and sealed in a thin, gas-tight envelope. The product shall be manufactured under a management system certified to ISO 9001: 2008, ISO 14001: 2008 and OHSAS 18001: 2007, and installed in accordance with the instructions issued by Kingspan Insulation Limited.

NBS Specifications

Details also available in NBS Plus.

NBS users should refer to clause(s):
H92 776 (Standard and Intermediate)



Cold Bridging

The use of a neoprene / plastic gasket, between the 'helping hand' bracket and the structure, will help to mitigate the effects of cold bridging. Please contact the Kingspan Insulation Technical Service Department (see rear cover) for further information.

Water Vapour Control / Condensation

Consideration should be given to the risk of condensation, when designing thermal elements.

A condensation risk analysis should be carried out following the procedures set out in BS 5250: 2002 (Code of practice for the control of condensation in buildings). The Kingspan Insulation Technical Service Department (see rear cover) can provide this service.

Fire Stops

Current Building Regulations / Standards should be considered with regard to the requirements for, and provision of, fire stops.

Glazed Curtain Walling Systems

Please contact the Kingspan Insulation Technical Service Department (see rear cover for details) for advice regarding the suitability of the *Kingspan OPTIM-R™ Rainscreen System* in glazed applications.

Lightning Protection

Designers should give consideration to the requirements of BS / I.S. EN 62305: 2006 (Protection against lightning).

Sitework

Installation

- Because rainscreen cladding systems are proprietary and utilise different mechanisms for attaching cladding panels to the wall structure, installation guidance should be sought from the system manufacturer.
- However, in the absence of any other guidance the instructions laid out below may be followed.
- The substrate against which the *Kingspan OPTIM-R™ Rainscreen System* panels are installed should be clean, dry and free from protrusions.
- The *Kingspan OPTIM-R™* element of the Rainscreen System should be installed with board edges lightly butted. Remaining areas of wall around brackets, openings, and other details which can not be insulated with the *Kingspan OPTIM-R™* element of the Rainscreen System should be in-filled with *Kingspan OPTIM-R™ flex*. Each *Kingspan OPTIM-R™ flex* panel is to be the same thickness as the *Kingspan OPTIM-R™* element of the Rainscreen System.
- *Kingspan OPTIM-R™ flex* should be cut neatly around fixings and brackets to avoid gaps.
- The *Kingspan OPTIM-R™* element of the Rainscreen System should be restrained to the substrate using a suitable proprietary adhesive. For further guidance on the specification of the proprietary adhesive please consult the Kingspan Insulation Technical Service Department (see rear cover) for assistance. *Kingspan OPTIM-R™ flex* should be restrained using mechanical fixings.
- The adhesive specification, and fixing rate, will potentially vary with the geographical location of the building, the local topography, the height and width of the wall structure, and the type of mechanisms being used to attach the cladding system.
- *Kingspan OPTIM-R™ flex* less than 300 mm in width should utilise a single row of insulation fasteners (with a suitable head or washer plate) along the centre line of the strip. Fixings within the row should be evenly distributed along the strip and located at centres no greater than 1200 mm, with a fixing located within 150 mm of each end of the strip. The requirement for additional fixings would need to be assessed on an individual project basis in accordance with BS EN 1991-1-4: 2005 (National annex to Eurocode 1, Actions on structures, General Actions, Wind Actions).
- Mechanical fixings for *Kingspan OPTIM-R™ flex* should be located greater than 50mm, but less than 150mm from the strip edge.
- Joints of the *Kingspan OPTIM-R™* element of the Rainscreen System, and at junctions between the *Kingspan OPTIM-R™* element of the Rainscreen System and *Kingspan OPTIM-R™ flex* should be taped using a minimum 75 mm wide self adhesive aluminium foil rainscreen cladding tape. In the absence of other protection, exposed edges of the *Kingspan OPTIM-R™ Rainscreen System* should be protected by a self adhesive aluminium foil tape, with a minimum 50 mm wide overlap onto the insulation board face.
- For further guidance on the specification of self adhesive aluminium foil tape and application guidance, please refer to:
Bostik Limited +44 (0) 1785 272 727
www.bostik.co.uk
Venture TapeEurope +44 (0) 1327 876 555
www.venturetape.com

Sitework

Fire Stopping

- Fire stopping systems are proprietary. Please contact the Kingspan Insulation Technical Service Department (see rear cover for details) for advice regarding the fire stopping strategy for your construction.

General

- The *Kingspan OPTIM-R*™ element of the Rainscreen System should not be used in association with solvent-based adhesive systems. The *Kingspan OPTIM-R*™ element of the Rainscreen System should not be exposed to naked flames or excessive heat.

Cutting

- The *Kingspan OPTIM-R*™ element of the Rainscreen System should not be cut or penetrated. The substrate must be clean, dry and level, and free of sharp objects or edges.
- Cutting of *Kingspan OPTIM-R flex* should be carried out either by using a fine toothed saw, or by scoring with a sharp knife, snapping the board over a straight edge and then cutting the facing on the other side.
- Ensure accurate trimming of *Kingspan OPTIM-R flex* to achieve close-butting joints and continuity of insulation.

Daily Working Practice

- At the completion of each day's work, or whenever work is interrupted for extended periods of time, board edges and joints should be protected from inclement weather.

Availability

- Please contact Kingspan Insulation for availability of the *Kingspan OPTIM-R*™ Rainscreen System.

Packaging and Storage

- The packaging of the *Kingspan OPTIM-R*™ Rainscreen System should not be considered adequate for outdoor protection. The *Kingspan OPTIM-R*™ Rainscreen System should be stored inside a building and raised off the floor.

Health and 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.

Please note that the reflective surfaces on this product are designed to enhance its thermal performance. As such, they will reflect light as well as heat, including ultraviolet light. Therefore, if this product 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.

Product Details

Composition

The *Kingspan OPTIM-R*™ element of the Rainscreen System comprises a rigid vacuum insulation panel with a microporous core which is evacuated, encased and sealed in a thin, gas-tight envelope.

Kingspan OPTIM-R flex comprises a premium performance rigid insulation faced on both sides with a composite foil facing.

Standards and Approvals

The *Kingspan OPTIM-R*™ Rainscreen System is manufactured to the highest standards under a management system certified to ISO 9001: 2008 (Quality Management Systems. Requirements), ISO 14001: 2004 (Environmental Management Systems. Requirements) and OHSAS 18001: 2007 (Health and Safety Management Systems. Requirements).

Standard Dimensions

The *Kingspan OPTIM-R*™ Rainscreen System panels are available in the following standard size(s):

Nominal Dimension		Availability
Length	(mm)	300 – 1200
Width	(mm)	300 – 600
Insulant Thickness	(mm)	20 – 60

Other sizes may be available dependent on order quantity. Please contact Kingspan Insulation for more details.

Compressive Strength

The compressive strength of the *Kingspan OPTIM-R*™ element of the Rainscreen System typically exceeds 160 kPa at 10% compression when tested to BS / I.S. EN ISO 826: 1996 (Thermal insulating products for building application. Determination of compression behaviour).

Durability

If installed correctly and protected from damage and penetration, the *Kingspan OPTIM-R*™ Rainscreen System can provide reliable long-term thermal performance over the lifetime of the building.

Resistance to Solvents, Fungi & Rodents

The *Kingspan OPTIM-R*™ Rainscreen System should not be used in association with solvent-based adhesive systems. Damaged boards or boards that have been in contact with solvents or acids should not be used.

The insulation core and facings used in the manufacture of the *Kingspan OPTIM-R*™ Rainscreen System resist attack by mould and microbial growth, and do not provide any food value to vermin.

Fire Performance

Kingspan OPTIM-R™ Rainscreen System can be used in multi storey buildings up to 18 metres in height. For buildings over 18 metres in height *Kingspan Kooltherm*® K15 Rainscreen Board can be used.

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 / I.S. EN 12667: 2001 (Thermal performance of building materials and products. Determination of thermal resistance by means of guarded hot plate and heat flow meter methods. Products of high and medium thermal resistance), with allowance for ageing and edge effect of the encapsulating film to form the design value.

Thermal Conductivity

The *Kingspan OPTIM-R*™ element of the Rainscreen System achieves a thermal conductivity (λ -value) of 0.007 W/m·K (aged design value allowing for edge effect).

Thermal Resistance

Thermal resistance (R-value) of the *Kingspan OPTIM-R*™ element of the Rainscreen System varies with thickness and is calculated by dividing the thickness of the panel (expressed in metres) by the thermal conductivity.

Insulant Thickness (mm)	Thermal Resistance (m ² ·K/W)
20	2.857
25	3.571
30	4.285
40	5.714
50	7.143
60	8.571

Contact Details

Customer Service

For quotations, order placement and details of despatches please contact the Kingspan Insulation Customer Service Department on the numbers below:

UK	- Tel:	+44 (0) 1544 388 601
	- Fax:	+44 (0) 1544 388 888
	- email:	customerservice@kingspaninsulation.co.uk
Ireland	- Tel:	+353 (0) 42 979 5000
	- Fax:	+353 (0) 42 975 4299
	- email:	info@kingspaninsulation.ie

Literature & 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 or as individual product brochures, Kingspan Insulation technical literature is an essential specification tool. For copies please contact the Kingspan Insulation Marketing Department, or visit the Kingspan Insulation website, using the details below:

UK	- Tel:	+44 (0) 1544 387 384
	- Fax:	+44 (0) 1544 387 484
	- email:	literature@kingspaninsulation.co.uk
	- www.kingspaninsulation.co.uk/literature	
Ireland	- Tel:	+353 (0) 42 979 5000
	- Fax:	+353 (0) 42 975 4299
	- email:	info@kingspaninsulation.ie
	- www.kingspaninsulation.ie/literature	

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	- Tel:	+44 (0) 1544 387 383
	- Fax:	+44 (0) 1544 387 483
	- email:	tapered@kingspaninsulation.co.uk
Ireland	- Tel:	+353 (0) 42 975 4297
	- Fax:	+353 (0) 42 975 4296
	- email:	tapered@kingspaninsulation.ie

Technical Advice / Design

Kingspan Insulation supports all of its 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 Technical Service Department 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 Service Department can also give general application advice and advice on design detailing and fixing etc... Site surveys are also undertaken as appropriate.

The Kingspan Insulation British Technical Service Department operates under a management system certified to the BBA Scheme for Assessing the Competency of Persons to Undertake U-value and Condensation Risk Calculations.



Please contact the Kingspan Insulation Technical Service Department on the numbers below:

UK	- Tel:	+44 (0) 1544 387 382
	- Fax:	+44 (0) 1544 387 482
	- email:	technical@kingspaninsulation.co.uk
Ireland	- Tel:	+353 (0) 42 975 4297
	- Fax:	+353 (0) 42 975 4296
	- email:	technical@kingspaninsulation.ie

General Enquiries

For all other enquiries contact Kingspan Insulation on the numbers below:

UK	- Tel:	+44 (0) 1544 388 601
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Ireland	- Tel:	+353 (0) 42 979 5000
	- Fax:	+353 (0) 42 975 4299
	- email:	info@kingspaninsulation.ie

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