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
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 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 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).

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/mK or less, the effect of which is insignificant, for the fixing of Kingspan fix and Kingspan OPTIM−R®.

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/mK or less, the effect of which is insignificant, for the fixing of Kingspan fix and Kingspan OPTIM−R®.

NB Where 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/mK or less, the effect of which is insignificant, for the fixing of Kingspan fix and Kingspan OPTIM−R®.

NB For the purposes of these calculations, the bridging effect of Kingspanfix and Kingspan OPTIM−R® has been taken to be 30%.

Refurbishment

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

<table>
<thead>
<tr>
<th>Insulant Thickness (mm)</th>
<th>U−values (W/m²•K)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>0.39</td>
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<td>25</td>
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<td>30 + 40</td>
<td>0.15</td>
</tr>
</tbody>
</table>

* Refer to Sitework
Typical Constructions and U-values

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

- Levelling compound
- Kingspan
- Timber cladding on battens
- Slate / tile on tiling battens and vertical battens
- Kingspan

**Figure 4**

<table>
<thead>
<tr>
<th>Insulant Thickness (mm)</th>
<th>U-values (W/m²·K)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>0.40</td>
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<tr>
<td>25</td>
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<td>0.20</td>
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<tr>
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<td>0.17</td>
</tr>
<tr>
<td>30 + 40</td>
<td>0.15</td>
</tr>
</tbody>
</table>

**Solid Brick Wall**

- Levelling compound
- Kingspan
- Render system incorporating EML or glass fibre mesh
- Render carrier board (magnesium silicate)
- Brick slips on carrier track
- Kingspan

**Figure 5**

<table>
<thead>
<tr>
<th>Insulant Thickness (mm)</th>
<th>Brickwork Thickness (mm)</th>
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</thead>
<tbody>
<tr>
<td>20</td>
<td>102.5                    0.47 0.44</td>
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<tr>
<td>25</td>
<td>102.5                    0.39 0.36</td>
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<tr>
<td>30</td>
<td>102.5                    0.33 0.32</td>
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<td>40</td>
<td>102.5                    0.26 0.25</td>
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<tr>
<td>50</td>
<td>102.5                    0.22 0.21</td>
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<tr>
<td>60</td>
<td>102.5                    0.18 0.18</td>
</tr>
<tr>
<td>30 + 40</td>
<td>102.5                    0.16 0.16</td>
</tr>
</tbody>
</table>

* Refer to Sitework

**U-values for Various Thicknesses of Kingspan External Wall System with Ventilated Cladding e.g. Timber or Tile Hanging**

**U-values (W/m²·K) for Various Thicknesses of the Kingspan System with a 10 mm Polymer Render on Render Carrier Board or Brick Slips on a Carrier Track**
Solid Brick Wall

Slate / tile on tiling battens and vertical battens
Mechanical fixings

Timber cladding on battens
13 mm dense plaster

Kingspan OPTIM R

Levelling compound

* Refer to Sitework

Figure 6

U-values (W/m²·K) for Various Thicknesses of
Kingspan OPTIM R External Wall System with
Ventilated Cladding e.g. Timber or Tile Hanging

<table>
<thead>
<tr>
<th>Insulant Thickness (mm)</th>
<th>Brickwork Thickness (mm)</th>
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</thead>
<tbody>
<tr>
<td></td>
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<tr>
<td>60</td>
<td>0.19</td>
</tr>
<tr>
<td>30 + 40</td>
<td>0.16</td>
</tr>
</tbody>
</table>

215 mm Solid Blockwork Wall

Brick slips on carrier track
Mechanical fixings

3 mm skim coated 12.5 mm plasterboard on plaster dabs

Kingspan OPTIM R

Levelling compound

* Refer to Sitework

Figure 7

New Build

U-values (W/m²·K) for Various Thicknesses of
Kingspan System with a 10 mm Polymer Render on Render Carrier Board or Brick Slips on a Carrier Track

<table>
<thead>
<tr>
<th>Insulant Thickness (mm)</th>
<th>Blockwork Density and λ-value (W/m·K)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dense (1.13)</td>
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<tr>
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<tr>
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<td>0.35</td>
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<tr>
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<td>0.30</td>
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<tr>
<td>40</td>
<td>0.24</td>
</tr>
<tr>
<td>50</td>
<td>0.20</td>
</tr>
<tr>
<td>60</td>
<td>0.21</td>
</tr>
<tr>
<td>30 + 40</td>
<td>0.15</td>
</tr>
</tbody>
</table>

* A 6.6% thermal bridging factor has been assumed for the effect of mortar joints.
** A 7.4% thermal bridging factor has been assumed for the effect of mortar joints.

Levelling compound*
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 (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 y-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).

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215 mm Solid Blockwork Wall

Linear thermal bridging at openings

<table>
<thead>
<tr>
<th>Insulant Thickness (mm)</th>
<th>Dense (1.13)</th>
<th>Medium (0.51)</th>
<th>Lightweight (0.15)*</th>
<th>Aerated (0.11)*</th>
<th>Thin Joint Aerated (0.11)**</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>0.42</td>
<td>0.38</td>
<td>0.28</td>
<td>0.26</td>
<td>0.25</td>
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<tr>
<td>25</td>
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<td>0.32</td>
<td>0.25</td>
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</tr>
<tr>
<td>30</td>
<td>0.31</td>
<td>0.29</td>
<td>0.23</td>
<td>0.20</td>
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<tr>
<td>40</td>
<td>0.25</td>
<td>0.23</td>
<td>0.19</td>
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<tr>
<td>50</td>
<td>0.20</td>
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<tr>
<td>30 + 40</td>
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<td>0.15</td>
<td>0.13</td>
<td>0.12</td>
<td>0.12</td>
</tr>
</tbody>
</table>

* 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.
Design Considerations

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. *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.

- *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).

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

*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 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.
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 tootheed 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

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

<table>
<thead>
<tr>
<th>Nominal Dimension</th>
<th>Availability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length (mm)</td>
<td>300 – 1200</td>
</tr>
<tr>
<td>Width (mm)</td>
<td>300 – 600</td>
</tr>
<tr>
<td>Insulant Thickness (mm)</td>
<td>20 – 60</td>
</tr>
</tbody>
</table>

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

Compressive Strength

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.

<table>
<thead>
<tr>
<th>Insulant Thickness (mm)</th>
<th>Thermal Resistance (m²-K/W)</th>
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<tbody>
<tr>
<td>20</td>
<td>2.857</td>
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<td>60</td>
<td>8.571</td>
</tr>
</tbody>
</table>

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.
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:

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- Tel: +44 (0) 1544 387 383
- Fax: +44 (0) 1544 387 483
- email: tapered@kingspaninsulation.co.uk

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- Tel: +353 (0) 42 975 4297
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- 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:

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- Tel: +44 (0) 1544 387 382
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General Enquiries
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Kingspan Insulation Ltd is a member of:
The Insulated Render and Cladding Association (INCA)
The National Insulation Association (NIA)