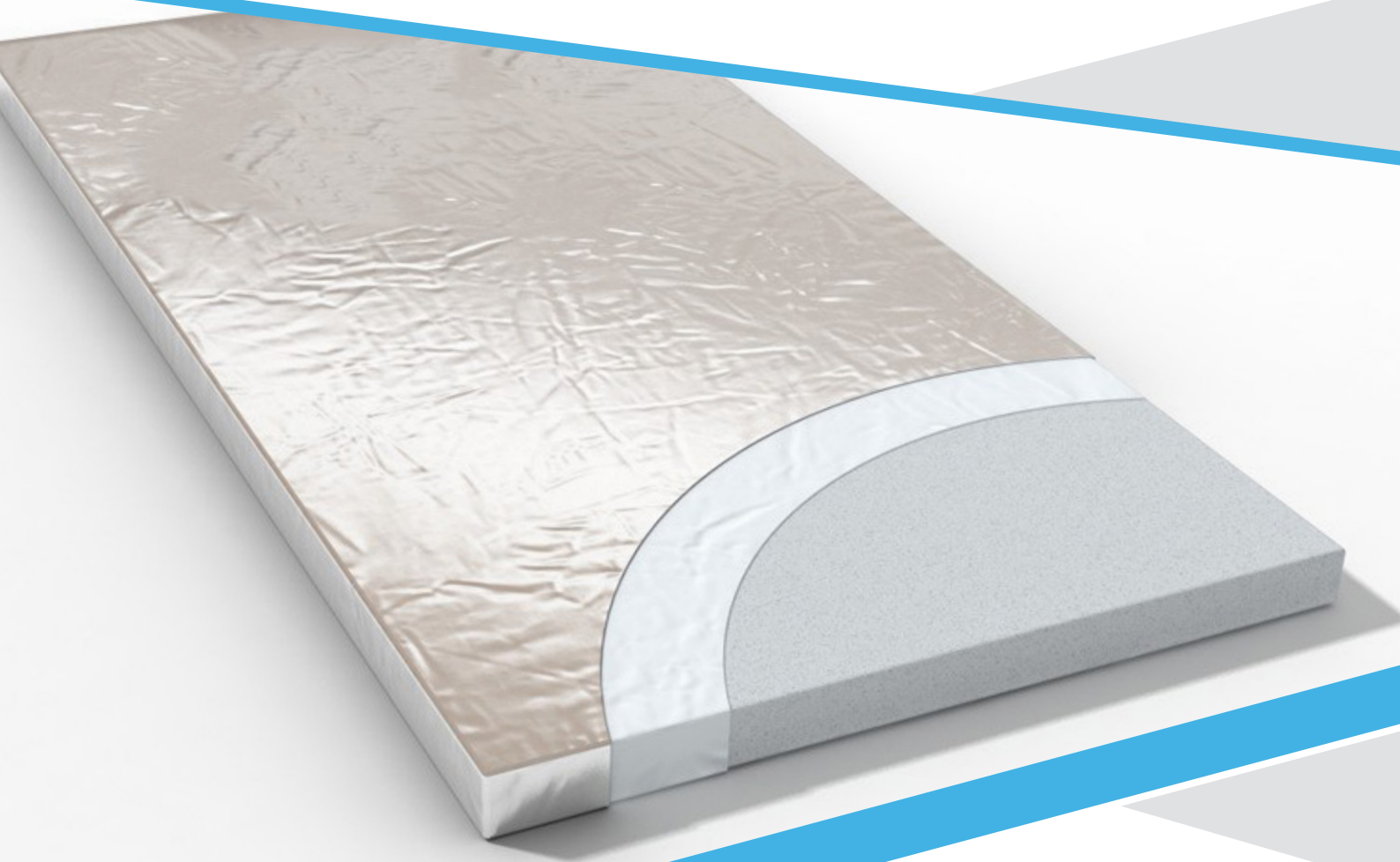
ALUMASC
ROOFING SYSTEMS

Alumasc Vtherm: Vacuum Insulated System for Inverted Roofs



Vtherm
VACUUM INSULATED SYSTEM

powered by Kingspan OPTIM-R powered by

www.alumascroofing.co.uk

ALUMASC
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Vtherm
VACUUM INSULATED SYSTEM

NEW WAVE INSULATION SOLUTIONS FOR PROTECTED MEMBRANE FLAT ROOFS AND GREEN ROOFS

- Rigid vacuum insulation panel with optimal performance – aged design value thermal conductivity 0.007 W/m.K
- Insulation performance up to five times better than commonly used insulation materials
- Ideal for projects with shallow construction depth
- Protects the waterproofing membrane
- Minimal water absorption
- Resistant to freeze / thaw cycling
- Ideal for green roof applications
- Panels are over 90% recyclable (by weight)
- Resistant to the passage of water vapour
- Ideal for new build and refurbishment projects
- Non-deleterious material

TYPICAL SYSTEM BUILD UP OPTION

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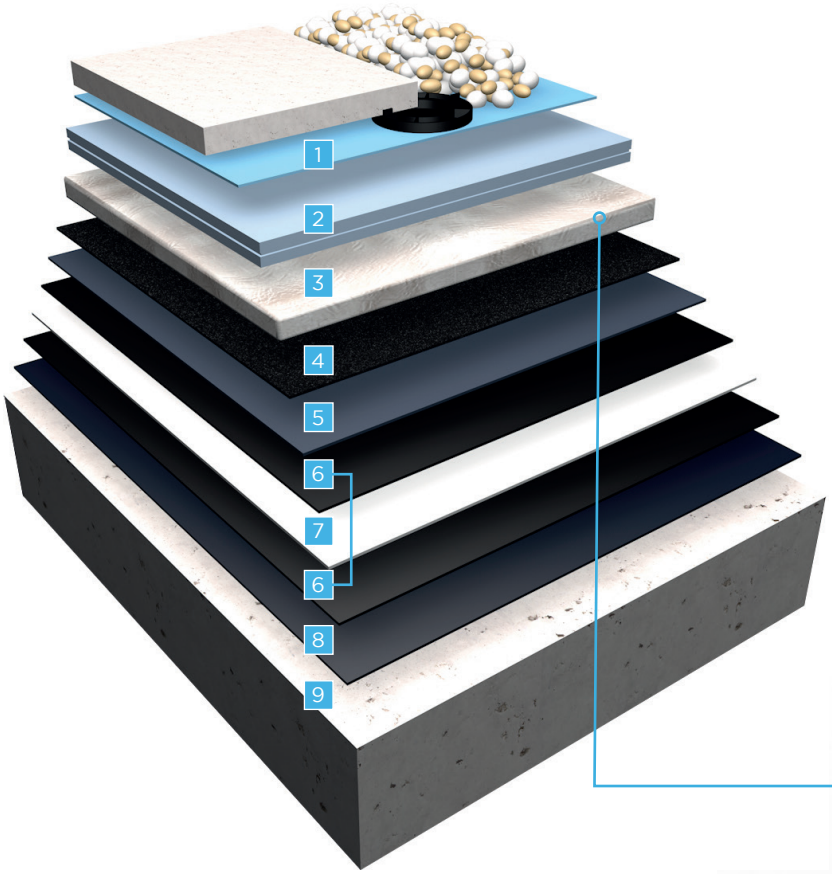


1. Alumasc Separation Layer
2. Alumasc XPS Insulation
3. Kingspan Optim-R Vacuum Insulation Panel
4. Protective Rubbercrumb Layer
5. Hydrogard Protection Layers
   Reinforced, modified bitumen protection sheets
6. Hydrotech MM6125 Waterproofing
   High performance bituminous structural waterproofing
7. Flex Flash Reinforcement Layers
   Options for Flex Flash F or Flex Flash UN
6. Hydrotech MM6125 Waterproofing
   High performance bituminous structural waterproofing
8. Alumasc Bitumen Primer
9. Structural Concrete

INTRODUCTION

The Problem

Whether you are dealing with a new build, or upgrading the roofs of existing buildings, there may be a requirement to achieve low U-values with the thinnest possible roof build-up.

With new build applications, regulatory requirements are ever more stringent, while economic factors and the need to conserve energy means that energy efficiency is the highest priority. One of the more effective approaches is to improve thermal performance while keeping the overall construction as thin as practicable. High performance insulation products are available that fulfil some, but not all, of the regulatory and performance requirements, particularly in applications where there is call for a thinner insulation product.

In refurbishment projects, there can be an even greater need to keep roof build-ups as thin as possible. Internal space may be at a premium, or there may be little or no space available for installing new roof insulation - for example in buildings where there are planning height restrictions.

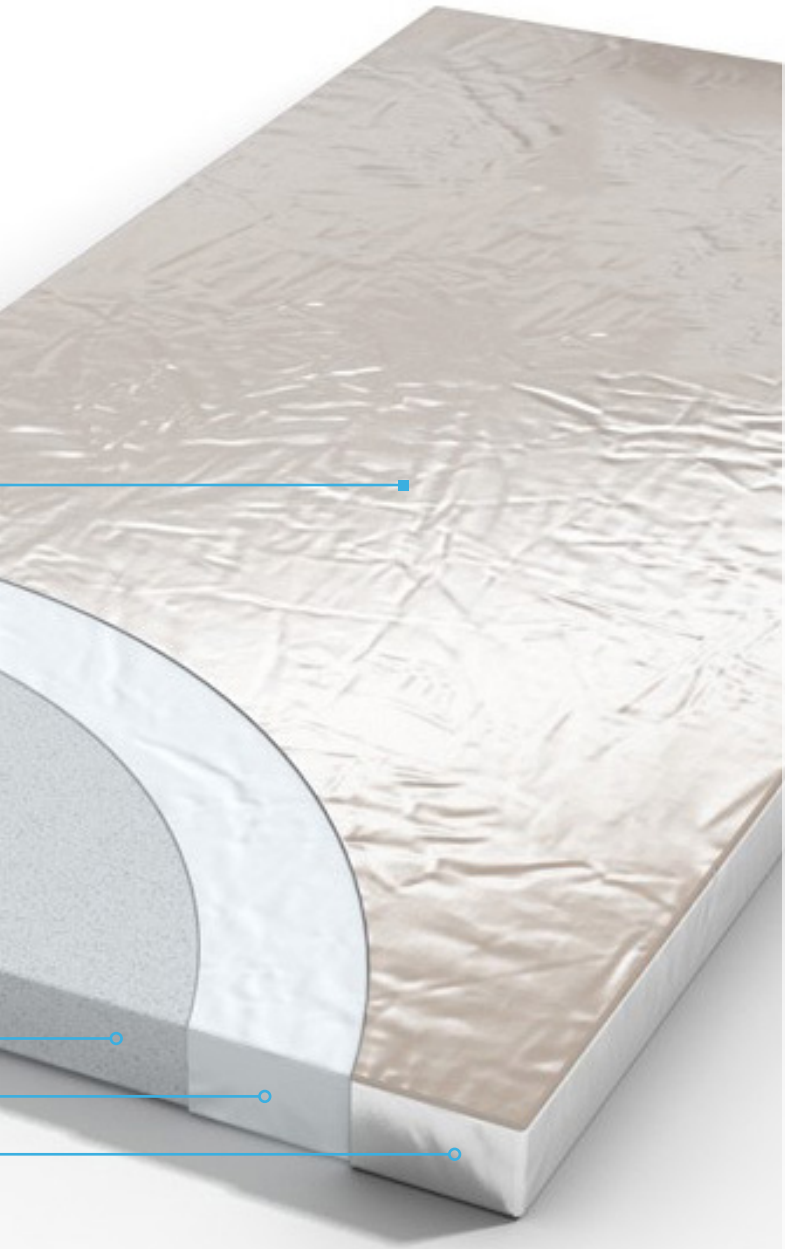
The Solution

The Alumasc VTherm Vacuum Insulated System has been developed to help solve such problems. Alumasc VTherm is an inverted roof system incorporating the innovative Kingspan OPTIM-R insulation panel system. This comprises rigid vacuum insulation panels with a microporous core, which is evacuated, encased and sealed in a thin, gas-tight envelope. The result is outstanding thermal conductivity in the thinnest possible insulation solution. The vacuum insulation panels in the VTherm System are augmented by rigid extruded polystyrene insulation infill panels, which can be cut to fit around problem areas such as rooflights or ventilator kerbs.

In retrofit applications, the Alumasc VTherm Vacuum Insulated System is the ideal solution for areas where lack of space could prevent upgrading of the insulation, and in new construction, Alumasc VTherm can enhance U-values in areas where thermal performance would otherwise be diminished.

The Kingspan OPTIM-R panels have an aged thermal conductivity of 0.007 W/m-K, and have an insulating performance up to five times better than commonly used insulation materials.

Above all, the Alumasc VTherm Vacuum Insulated System solves the problem of insulating areas where there is a lack of construction depth.



TYPICAL CONSTRUCTIONS AND U-VALUES

Assumptions

U-values are 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 BR 443 (Conventions for U-value calculations). The method detailed in part D4.2 of BS / I.S. EN ISO 6946: 2007 has been used to take account of the effect of a high performance non-woven, polyethylene membrane over the insulation, and an (fx) factor of ≤ 0.012 has been assumed.

They assume a nominal selection of postcodes, selected to represent the influence of geographical variations in rainfall on thermal performance.

The ceiling, where applicable, is taken to be a 3 mm skim coated 12.5 mm plasterboard with a cavity between it and the underside of the deck.

Please Note:

- *For the purposes of these calculations the standard of workmanship has been assumed good, and therefore the correction factor for air gaps has been ignored.*
- *The figures quoted are for guidance only. A detailed U-value calculation and a condensation risk analysis should be completed for each project.*
- *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 Alumasc Technical Department for assistance (see rear cover).*
- *For the purposes of these calculations, the bridging effect of the infill panel has been taken to be 15%.*

Bespoke Project Design

Alumasc offers a full design service, which maximises the ratio of Vacuum Insulation Panels to infill panels. We will design the panel layout quickly and effectively, ready for client approval.

Each project-specific layout will show the size, number and location of the Vacuum Insulation Panels and similar data for any infill panels that may be required.

For more details please contact our technical team on 01744 648 400.

Protected Membrane Roofs

This literature demonstrates the Alumasc VTherm Vacuum Insulated System used as a component of protected membrane roofing systems with a gravel or paying slab finish, and as a component of green roofs.

In protected membrane roofing systems the insulation is located above the waterproofing, a construction that offers several advantages over traditional warm flat roofs.

- Because the waterproofing system is not exposed to the elements, it can be expected to have a longer life than non-protected membrane systems. The VTherm System is protected from mechanical damage, UV degradation, and daily and seasonal temperature extremes.
- No condensation risk.
- The roof achieves an EXT.FAA fire rating with gravel ballast and paving slab protective finishes.
- Insulation can be lifted to allow inspection of the waterproofing.
- Additional insulation can be added at a later date if required.
- Successful installation of the insulation is not affected by weather conditions.

Design Loads & Roof Structure

The suitability of any structure to accept design loads – including the increased dead load from ballast, snow and roof traffic – should be verified in accordance with BS 6399-3: 1988 (Loading for buildings. Code of Practice for imposed roof loads).

The additional load from ballast can be considerable.

Ballast Layer	Dead Load
50 mm thick paving slabs	125 kg/m²
Gravel (16–32 mm diameter)	16 kg/m2 per 10 mm depth
Intensive green roof	180 – 500 kg/m²
Semi–intensive green roof	120 – 200 kg/m²
Extensive green roof	60 – 150 kg/m²

The layer of ballast resists uplift from wind, prevents flotation of the boards after heavy rain, prevents UV degradation of the boards, and gives the roof the required external fire performance rating.

Kingspan OPTIM-R produced at Kingspan Insulation's Pembridge manufacturing facility is certified to BES 6001 (Framework Standard for the Responsible Sourcing of Construction Products) 'Very Good'.

Linear Thermal Bridging

Make provision to limit the effects of cold bridging. Ensure that rooflight or ventilator kerbs, gutters, etc. are adequately insulated with Alumasc Upstand Board. Similarly insulate around the perimeter of the roof on the internal face of parapets.

Maintain a minimum distance of 300 mm between the top of the insulation upstand and the bottom of the horizontal roof insulation. Carry wall insulation up parapets as high as the flat roof insulation upstand. Please contact the Alumasc Technical Department for further advice (see back cover).

Sample Specification Clause

Specify the Vacuum Insulation Panel element of the VTherm systems as follows:

The roof insulation shall be the Alumasc VTherm Vacuum Insulation Panel ..... 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, BS OHSAS 18001: 2007, and ISO 50001: 2011 and installed in accordance with the instructions issued by Alumasc Roofing Systems.

Wind Loads

Ensure that the resistance to wind uplift of the waterproofing system, insulation and ballast is 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). BRE Digest 295 gives specific design guidelines for loose-laid insulation systems.

In sheltered exposure zones, or on buildings of up to 10 storeys, the self-weight of a minimum 50 mm gravel ballast layer (minimum 80 kg/m^2), installed over a non-woven polyethylene membrane, is generally sufficient to ensure that both the insulation boards and waterproofing system remain stable under the full design load.

In moderate exposure zones, or on buildings of up to 10 to 15 storeys, a 50 mm gravel ballast specification is generally sufficient, with the perimeter additionally loaded with 50 mm thick paving slabs.

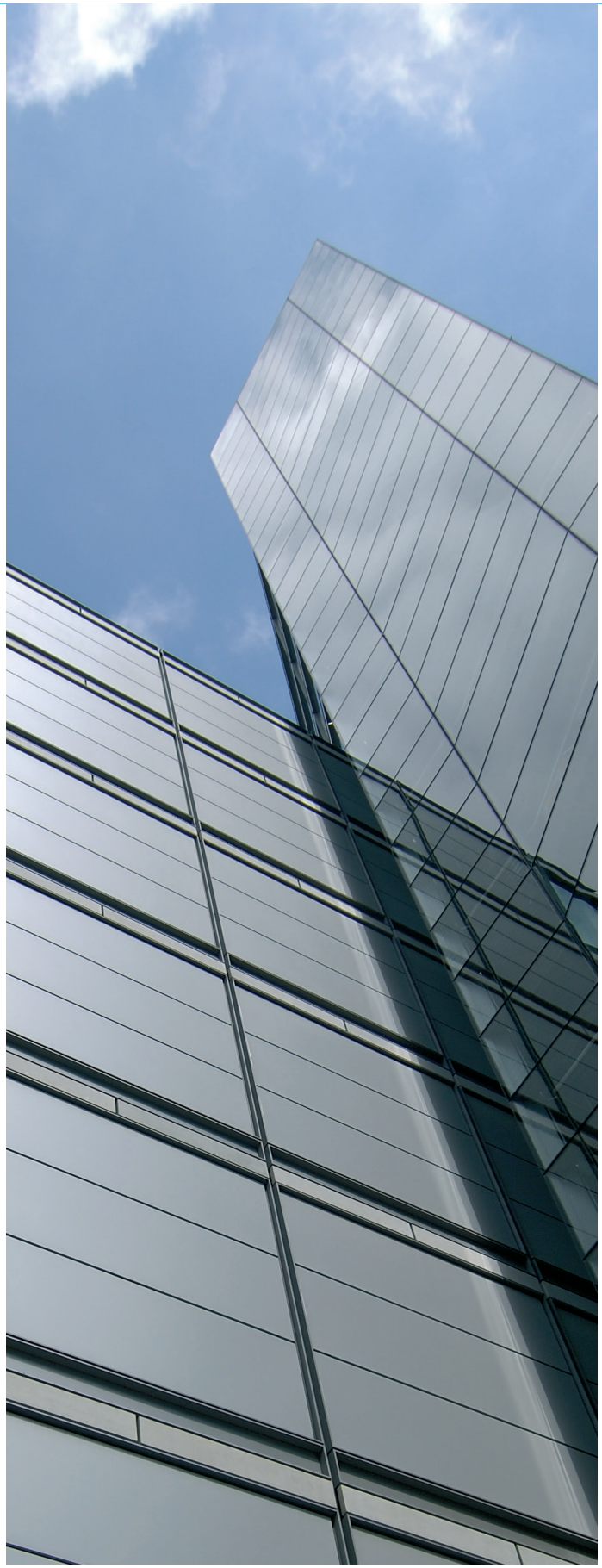
Seek specialist advice for severe exposure zones or tall buildings over 15 storeys. Refer to BRE Digest 311 (Wind scour of gravel ballast on roofs).

Flotation

The ballast specifications detailed in the 'Wind Loads' section (above) will be sufficient to prevent flotation of the insulation boards after heavy rain.

Falls

Protected membrane roofing systems incorporating the Alumasc VTherm Vacuum Insulated System can be laid on roofs to zero falls, all in accordance with Hydrotech BBA certificate 90/2431.



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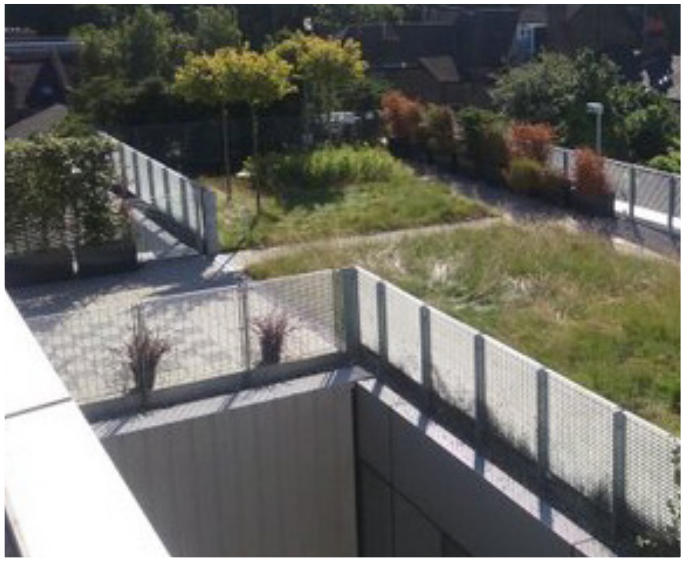
RAINFALL FACTORS

Rainfall Analysis

The requirements of BS / I.S. EN ISO 6946: 2007 part D.4.2 (Correction due to water flowing beneath the insulation and the waterproofing membrane) dictate that inverted roof constructions are subject to a geographical rainfall analysis. The cooling effect of rainwater flowing between and beneath the insulation boards, can mean that greater thicknesses of insulation are required to meet desired U-values (particularly in locations that receive high levels of rainfall).

The use of a high performance non-woven polyethylene membrane over the insulation can dramatically minimise heat loss by reducing the amount of rainwater that flows between the insulation boards. This reduction in rainwater flow is represented by the infiltration (fx) factor of the membrane. The fx factor of a membrane is fall (gradient) specific, and an fx factor measured on a fall can not be used to represent the performance of a membrane if installed horizontally.



Drainage

When assessing the number and types of rainwater outlet, refer to and ensure compliance with BS EN 12056-3: 2000 (Gravity drainage systems inside buildings. Roof drainage, layout and calculation). The rainwater outlets should allow rainwater to be drained from the roof surface at both the membrane level and the upper surface level.

Roof Waterproofing

The Alumasc VTherm Vacuum Insulated System should be used over the hydrotech hot liquid applied waterproofing system.

Water Vapour Control

Protected membrane roofs are inherently safe as regards condensation risk. To assess the risk of interstitial condensation in a roof construction, refer to BS 5250: 2002 (Code of Practice for control of condensation in buildings) or BS 6229: 2003 (Flat roofs with continuously supported coverings. Code of Practice).

Green Roofs

Benefits

Green roofs are an alternative to a standard protected membrane roof and offer many advantages. However, precise design and detailing are required.

Green roofs can:

- Reduce levels of dust and improve humidity.
- Provide a habitat attractive to wildlife.
- Create areas for recreational activities.
- Retain rainfall and therefore prevent water surges into the drainage system.
- Improve sound insulation.
- Provide a finish that is visually more attractive than gravel or paving slab ballast.

Types of Green Roof

There are three principal types of green roof.

Extensive green roofs - Have a relative shallow growing medium, with low-maintenance vegetation such as sedum and grass. They are lightweight, and simple to design, construct and maintain. They are not suitable for regularly trafficked areas or recreational activity. Extensive systems have aesthetic appeal and offer ecological benefits.

Semi–intensive green roofs - Have a deeper growing medium and support vegetation such as grasses, perennials and shrubs. They can accommodate limited access for maintenance and light recreation.

Intensive green roofs - Have a significantly deeper growing medium and support a wide range of flora, including grasses, shrubs and small trees. They resemble normal gardens as regards care and maintenance, and can be used for recreational activities.

Semi-intensive and intensive green roofs require careful design, and incorporate the following elements:

Growing Medium

Specialist, lightweight mixtures are available, incorporating filtration, drainage and moisture retention functions.

Drainage Layer

Normally consisting of a castellated plastic (HDPE) sheeting, with filtration membrane. This layer promotes the rapid removal of excess rainwater from the roof, thereby avoiding saturation of the growning medium and associated increase in weight.

Root Barrier

The roots of growing plants can seriously damage waterproof membranes, by growing into any small cracks, lap joints, etc. Alumasc root-resistant protection sheet is adhered to the Hydrotech membrane, with all joints sealed by torching, and must be continued up the vertical faces of upstands.

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WATERPROOFING

Before installing the Alumasc VTherm Vacuum Insulated System, it is essential to ensure that the waterproofing system has been installed correctly and that the roof is watertight, clean and leak tested. The surface of the waterproofing should be smooth, flat and free from projections.

Insulation Boards

- Use a rubber crumb protection layer under the Alumasc VTherm Vacuum Insulated System. For further information please contact the Alumasc Technical Department (see back cover).
- Lay VTherm panels break bonded where practicable, with joints lightly butted. Ensure there are no gaps at abutments.
- Where runs of Alumasc VTherm Vacuum Insulated System panels do not accurately fit the dimension of the roof, use infill panels to make up the difference. Infill panels must be the same thickness as the VTherm panels.
- Install the Alumasc Extruded Polystyrene overlay as soon as possible to avoid exposing the Alumasc VTherm System to direct foot traffic.
- Lay any infill panels to abut the roof perimeter and any upstands or roof penetrations such as drainage outlets, to take account of building tolerances.
- Insulate upstands at the roof perimeter and the internal face of parapets.
- Maintain a minimum distance of 300 mm between the top of the insulation upstand and the bottom of the horizontal roof insulation.
- Take particular care when installing Alumasc VTherm Systems in windy conditions.

Alumasc Separator Sheet

- Always lay Alumasc Separator Sheet over the insulation panels.
- Where one run of separator sheet membrane laps another, maintain a minimum 300 mm side and end overlaps, in the direction of drainage.
- Turn up the separator sheet membrane at the edge of the roof insulation and secure it under the flashing.

Gravel Ballast

- Install the ballast layer as soon as possible to ensure that the Alumasc Separator Sheet is always protected and not damaged by excessive heat build-up or high winds.
- Gravel ballast should be washed, rounded to 20-40 diameter, and laid to a minimum of depth of 50 mm.
- The diameter of the gravel is significant because a size of 20-40mm has been found to offer the most effective resistance to wind scour. Refer to BRE Digest 311 for advice.

Paving Slab Ballast

- Lay minimum 50 mm thick paving slabs, over Alumasc Separator Sheet, on proprietary paving slab supports to maintain drainage below the slabs and to ensure that moisture vapour can escape.
- Install the paving slabs and supports as soon as possible to ensure that the separator sheet is always protected and to prevent excessive heat build-up or high winds do not damage the insulation panels.
- Ensure that gaps between paving slabs and upstands are filled with washed rounded gravel, nominal 20-40 mm diameter.

Roof Gardens

- Install the Alumasc VTherm Vacuum Insulated System as described previously.
- Overlay the panels with Alumasc Separator Sheet – installed as described previously.
- Install a filtration layer or combined filtration layer / drainage mat.
- Install the growing medium, generally 50-200 mm deep. Specialist spray systems are available, which allow the application of the growing medium and grass / plant seed to be applied in one operation.
- Assess the depth of the growing medium with regard to wind loads 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).

Wheeled / Foot Traffic

- Take care not to walk on the VTherm vacuum insulated insulation panels. Use a protective foot or crawl board during the installation process.
- The infill panels and the Alumasc Extruded Polystyrene Overlay may be walked on.

General

- Do not use the Alumasc VTherm Vacuum Insulated System in association with solvent-based adhesive systems. Avoid exposure of the VTherm system to naked flames or excessive heat.

Cutting

- Do not cut or penetrate the Vacuum Insulation Panels. Ensure the substrate is clean, dry and level, and free from sharp objects or edges.
- Cut the infill panels with a fine-toothed saw, or by scoring with a sharp knife and snapping the board over a straight edge and then cutting the facing on the other side.
- Ensure accurate trimming of the infill panels to achieve close-butting joints and continuity of insulation

Availability

- Please contact Alumasc Sales Dept for availability of the Alumasc VTherm Vacuum Insulated System.

Packaging and Storage

- The packaging of the Alumasc VTherm Vacuum Insulated System should not be considered adequate for outdoor protection. Store indoors and raised off the floor.

Health and Safety

- Alumasc Insulation products are chemically inert and safe to use.
- A Safety Data Sheet is available on the Alumasc Roofing website.

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.

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PRODUCT DETAILS

Composition

The Vacuum Insulation Panels comprise a rigid vacuum insulation with a microporous core, which is evacuated, encased and sealed in a thin, gas-tight envelope.

The infill panels comprise a high-performance rigid extruded polystyrene insulation.

Standards and Approvals

The VIP Panel 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), BS OHSAS 18001: 2007 (Health and Safety Management Systems. Requirements) and ISO 50001: 2011 (Energy Management Systems. Requirements with Guidance for Use).

Standard Dimensions

The Vacuum Insulation Panels are available in the following standard size(s):

Nominal Dimension	Availability
Length	**300 - 1200 mm**
Width	**300 - 600 mm**
Insulant Thickness	**20 - 60 mm**

Other sizes may be available dependent on order quantity. Please contact Alumasc Roofing for more details.

Compressive Strength

The compressive strength of the Kingspan OPTIM-R panels typically exceeds 150 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 Alumasc VTherm Vacuum Insulated System can provide reliable long-term thermal performance over the lifetime of the building.

Resistance to Solvents, Fungi & Rodents

The Alumasc VTherm Vacuum Insulated 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 Alumasc VTherm Vacuum Insulated System resist attack by mould and microbial growth, and do not provide any food value to vermin.

Fire Performance

The Alumasc VTherm Vacuum Insulated System, when subjected to the British Standard fire test specified in the table below, will achieve the result shown, when the surface finish is either minimum 50 mm gravel ballast or minimum 40 mm paving slabs.

Test	Result
BS 476–3: 2004 (External fire exposure roof test)	**Ext. FAA rating**

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

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 Alumasc Technical Department (see back cover) for further advice.

Thermal Properties

The 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 Vacuum Insulation Panels achieve a thermal conductivity (K-value) of 0.007 W/mK (aged design value allowing for edge effect).

Thermal Resistance

Thermal resistance (R-value) of the Vacuum Insulation Panels varies with thickness and is calculated by dividing the thickness of the panel (expressed in metres) by the thermal conductivity (K).

Insulant Thickness (mm)	R Value Thermal Resistance (m2-K/W)
20	**2.857**
25	**3.571**
30	**4.285**
40	**5.714**
50	**7.143**
60	**8.571**

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Tried, Tested, Trusted

Unrivalled roofing solutions with a proven track record

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