

Cellular Glass Insulation Guide

FOAMGLAS® for the Building Envelope

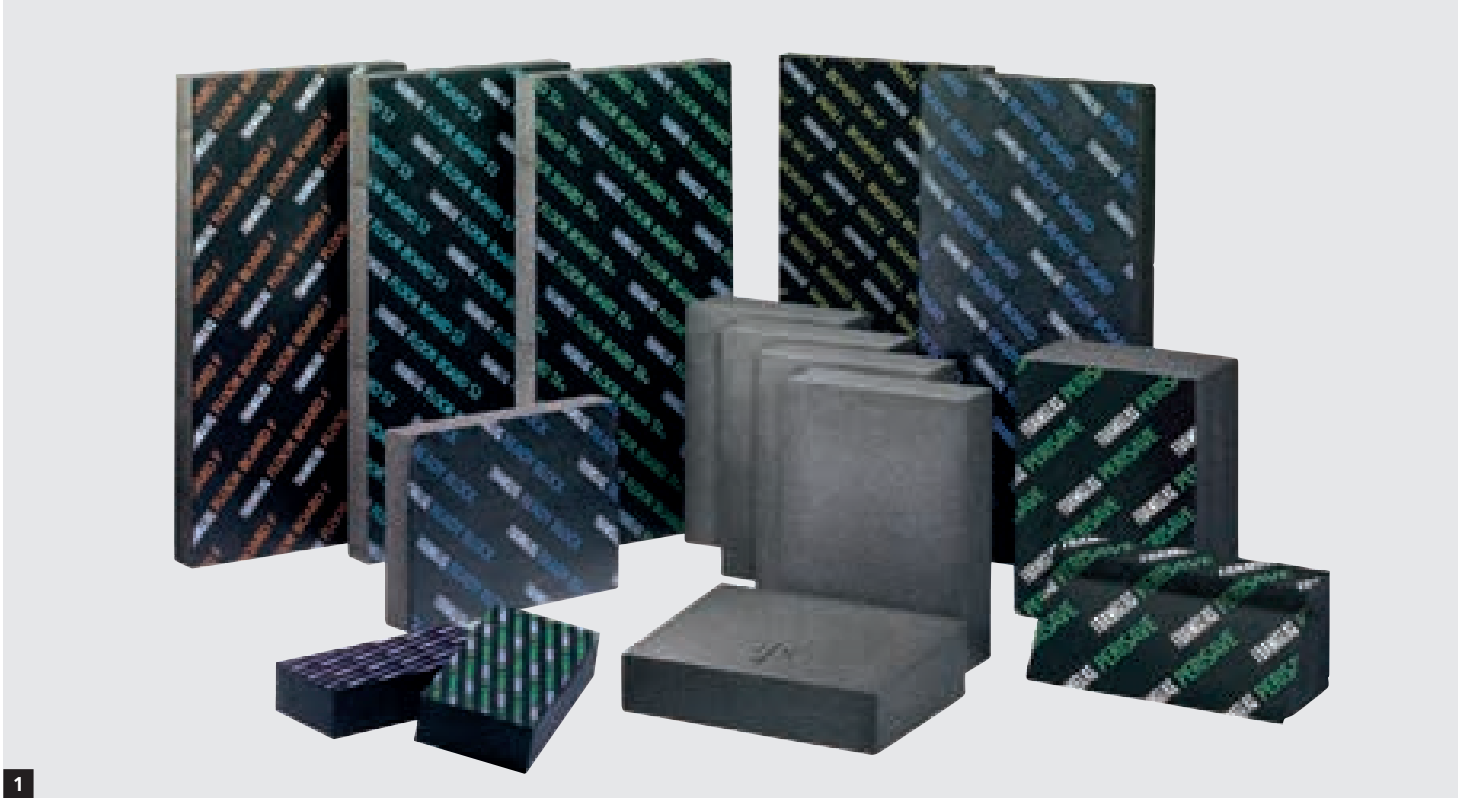
www.foamglas.co.uk

FOAMGLAS®
Building



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What is FOAMGLAS® Cellular Glass Insulation?

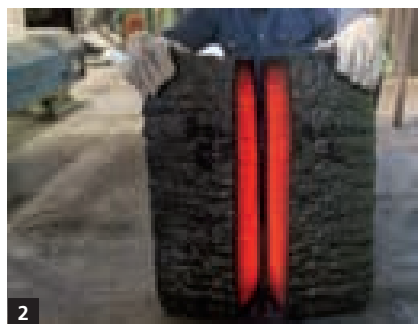
In 1937, Pittsburgh Corning Corporation built their first cellular glass manufacturing facility in Pittsburgh, USA.

FOAMGLAS® cellular glass insulation is the result of more than 70 years of experience and continual product improvement. The UK Office opened in 1975, and is supplied with FOAMGLAS® from the European production plants; the newest opened in 2008 at Klášterec in the Czech Republic. Looking toward the future, the construction of new production facilities and technical offices are planned to service expanding economies around the world.

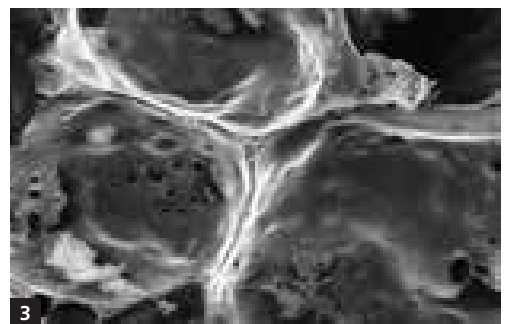
A resilient building material

FOAMGLAS® cellular glass insulation is a light and rigid insulating material. The hermetically sealed glass walled cells will not allow the transmission of liquid, gas or vapour through the material.

- 1 FOAMGLAS® product range.
- 2 FOAMGLAS® insulation block inspection during production.
- 3 Microscope image of FOAMGLAS® cellular glass.
- 4 Quality control for the finished product.



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Completely inorganic and 100% closed cell, FOAMGLAS® provides a typical combination of physical properties. This highly resilient building material withstands the most demanding conditions to be found in construction today.

FOAMGLAS® has proven longevity and reliability over the lifetime of the building.

Adjustments during the manufacturing process alter the density of the cellular glass; this in turn changes the thermal conductivity. Low density materials have a lower thermal conductivity value and are used for soffits, walls and façades. Where a higher compressive strength is required, you would specify a higher density cellular glass material.

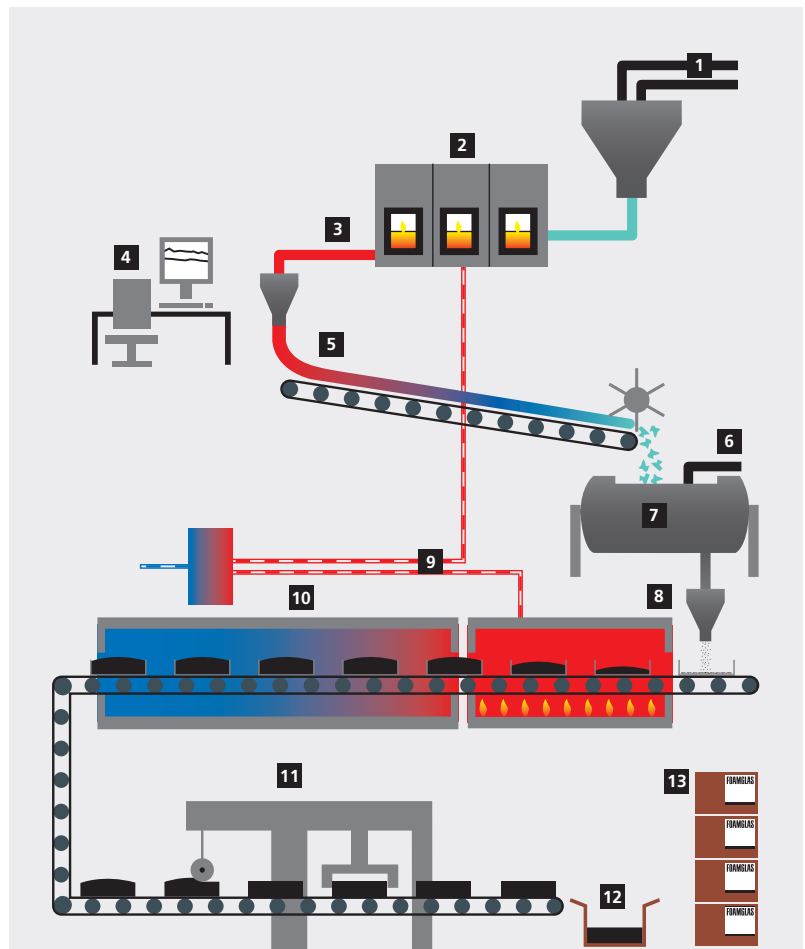
Manufacturing Process

FOAMGLAS® is manufactured primarily from minimum 60% recycled glass and abundant natural raw materials.

The mix of raw materials and adjustments during the manufacturing process determine the specific combination of FOAMGLAS® properties.

Millions of hermetically sealed glass cells make up the cellular structure; resulting in a vapour tight, waterproof material with an extraordinary structural strength.

For the building market, a range of Slab, Block and Board insulation products are available in a wide variety of types and thickness.



FOAMGLAS® Manufacturing Process

- 1 The raw materials are batched and mixed.
- 2 The smelting furnace.
- 3 Molten glass is tapped off from the smelting furnace.
- 4 Control room for monitoring the production.
- 5 The glass is tapped off onto the conveyor belt, where it cools down before entering into the ball (crushing) mill.
- 6 The ball mill is loaded with the cooled glass.
- 7 The ball mill grinds all the ingredients into a fine powder before it is loaded into stainless steel trays.
- 8 The filled trays pass through an 850° C oven and the natural process of oxidation takes place. Hermetically sealed vacuum cells are formed within the molten glass, generating the unique cellular structure.
- 9 Recovery of heat energy.
- 10 To remove thermal stresses, the FOAMGLAS® passes through a closely controlled cooling (annealing) process.
- 11 The FOAMGLAS® is cut to size, any off-cuts are returned to the beginning of the production process.
- 12 FOAMGLAS® products are packaged and labelled.
- 13 The finished FOAMGLAS® products are stored and prepared for transport.

FOAMGLAS® Features and Benefits



- 1 **Waterproof** FOAMGLAS® consists of pure glass, it has a truly hermetically sealed, closed cell, glass structure. It is watertight.
Advantage: The close cell structure prevents water absorption, penetration or tracking by capillary action.
- 2 **Time tested thermal performance** FOAMGLAS® has excellent insulating properties and maintains its thermal performance in the long-term due to its hermetically sealed, closed-cell, glass structure.
Advantage: Permanently achieves high R-values for the lifetime of the building, ensures reliable energy savings and a comfortable indoor climate all year.
- 3 **Compressive loads** FOAMGLAS® supports high compressive loads without deflection or movement.
Advantage: It is the ideal insulation material for load bearing areas, such as, foundations, floors, walkways, terraces, podium roofs, balconies, vehicle parking, and for supporting M&E equipment.
- 4 **Fire and fumes** FOAMGLAS® consists of pure glass, it's non-toxic and non-combustible.
Advantage: It does not combust, support fire, produce fumes, or present a fire risk in the building structure. Fire behavior: Classification according to EN 13501: A1, non-combustible; classification according to ASTM E 84, smoke development and flame spread - zero.
- 5 **Vapour control** FOAMGLAS® consists of pure glass, it has a truly hermetically sealed, closed cell, glass structure. It is gas and vapour tight.
Advantage: FOAMGLAS® is vapour tight, providing both an insulation and high performance vapour barrier in one material.
- 6 **Dimensionally stable** FOAMGLAS® has a low coefficient of thermal movement, in the same range as concrete and steel.
Advantage: It can be adhesive bonded onto the structure, no mechanical fixings, therefore no thermal bridging.
- 7 **Acid and chemical resistant** FOAMGLAS® consists of pure glass, it is resistant to organic solvents and acids.
Advantage: It can withstand aggressive mediums and demanding environments.
- 8 **Easy to cut** FOAMGLAS® consists of pure glass.
Advantage: It is non-toxic, non-hazardous, it does not contaminate the water table; and is easily cut using hand tools.
- 9 **Ecological** FOAMGLAS® is manufactured using minimum 60% recycled glass. It has a GWP < 1,5 and ODP = 0. It is free of environmentally damaging flame retardants and gas propellants.
Advantage: FOAMGLAS® can be recycled or used in landscaping.





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- 1 Kew Gardens, London; Temperate House. Photo: David Iliff.
- 2 FOAMGLAS® is produced with certified green energy from hydropower plants.

Ecology and Sustainability

Selecting truly sustainable products is now part of the design process. FOAMGLAS® insulation meets with the highest standards.

FOAMGLAS® insulation is manufactured from minimum 60% locally sourced recycled glass, including scrap vehicle glass and off-cuts from the window industry. Raw materials are mineral based and abundant natural resource.

Commitment to environmental stewardship

Certified green electricity from Norwegian and French hydropower plants supply power to the FOAMGLAS® factory at Tessenderlo in Belgium. This introduction of green energy is just one part of our commitment to reducing the amount of embodied energy required in the manufacturing process. Further information on our energy strategy may be found within the 'Environmental Product Declaration', which can be downloaded at www.foamglas.co.uk

The hermetically sealed FOAMGLAS® glass cell structure is naturally produced, it's free from ecologically harmful blowing agents and flame retardants. Mutagenic, or carcinogenic chemicals are not used during production.

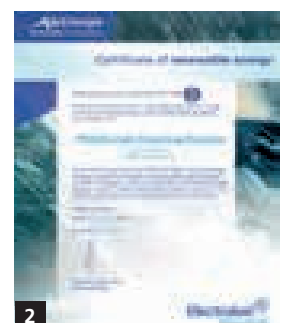
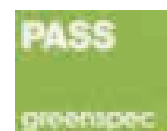
FOAMGLAS® is an inert non-toxic material. At the end of the building's life FOAMGLAS® can

be safely incorporated into hardcore or landscaping.

The European organisation 'natureplus' examines the origin of all recycled and raw materials used by a manufacturer. Natureplus considers both the environmental impact of the manufacturing process and building works at the construction site. Natureplus reviews existing and forthcoming environmental policies. Natureplus lobby government for a new approach to all construction works and promote the use of recycled and sustainable building materials: <http://www.natureplus.org/>

The FOAMGLAS® manufacturing facilities conform to strict environmental compliance and are registered for ISO 14001 accreditation. Full details are within the FOAMGLAS® Environmental Product Declaration, an independently produced report, which is used for assessing the "green credentials" of all materials.

FOAMGLAS® insulation has a Global Warming Potential of less than 1.5 and an Ozone Depleting Potential of Zero!

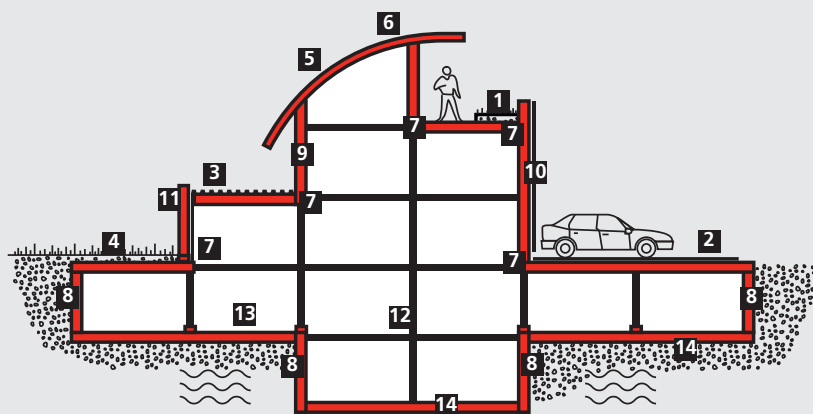


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1 National Maritime Museum, London, Gallery roof and restaurant terrace. Architects: Purcell Miller Tritton.

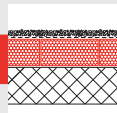
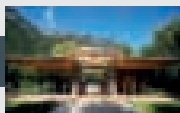
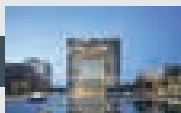
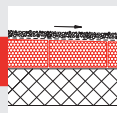
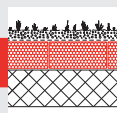
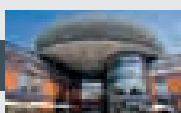
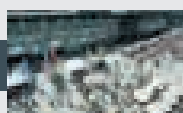
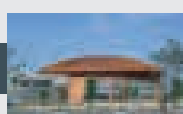
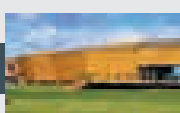
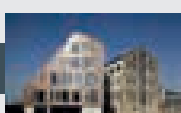
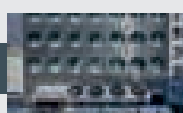
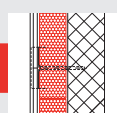
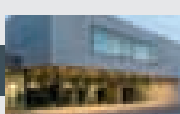
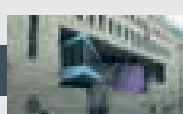
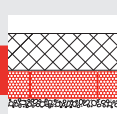
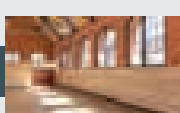
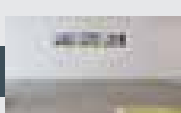
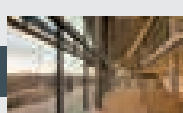
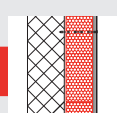
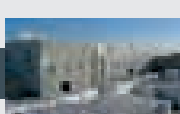
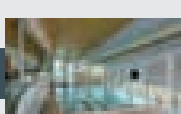
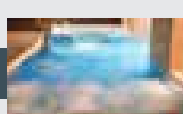
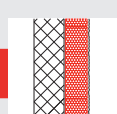
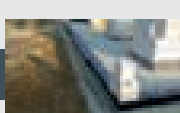
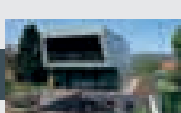
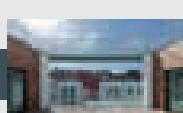
FOAMGLAS® for the Building Envelope



Applications

- | | |
|------------------------------------|--|
| 1 Flat roof with pedestrian access | 8 Below ground, wall (insulation in load bearing conditions) |
| 2 Flat roof with vehicle access | 9 Cavity walls |
| 3 Flat roof on metal structure | 10 Rainscreen façade |
| 4 Green roof | 11 Cladding panel façade |
| 5 Metal roof finishes | 12 Interior walls |
| 6 Pitched roof (tiles and slates) | 13 Internal floors |
| 7 Prevention of thermal bridging | 14 Below ground, floor (insulation in load bearing conditions) |

FOAMGLAS® Applications

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Flat Roofing: Flat Roofs on Concrete, Timber and Metal Structures

The roof is a very important element of the building envelope. Flat roofs perform many tasks, from car parking, walkways, playgrounds, terraces and platforms for M & E Equipment. The flat roof must provide reliable thermal and weatherproof protection for the entire service life of the building.

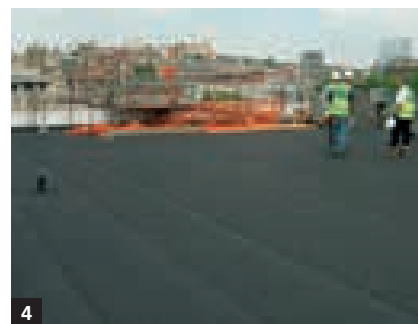
FOAMGLAS® cellular glass insulation is ideal for the most demanding roof situations. With a closed cell vapour tight internal structure, its capability to withstand high compressive loads and a thermal performance tested by time; FOAMGLAS® is proven to stand the test of time.

Technical features and benefits

■ Compressive loads

FOAMGLAS® supports high compressive loads without deflection or movement. It is the ideal insulation material for load bearing areas, such as, foundations, floors, walkways, terraces, podium roofs, balconies, vehicle parking and for supporting M & E equipment.

- 1 One New Change building, St. Paul's, London. Concept Architect: Jean Nouvel
Executive Architect: Sidell Gibson
FOAMGLAS® insulation gives peace of mind.
Photo: EG Focus.
- 2 FOAMGLAS® Tapered insulation for the Manchester Control Tower. Architects: CPMG, Nottingham.
- 3 FOAMGLAS® TAPERED insulation for public concourse: Entrance to London Bridge Station and the Shard Tower.
- 4 Bristol Industrial Museum, Bristol. Architect: LAB Architects.





FOAMGLAS® flat and tapered insulation can be used on concrete, timber and metal structures

■ Fire and fumes

FOAMGLAS® consists of pure glass, it's non-toxic, does not combust, support fire, produce fumes, or present a fire risk within the building structure.

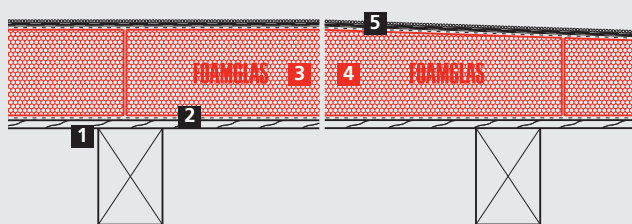
■ Water and vapour control

FOAMGLAS® consists of pure glass, it has a truly hermetically sealed, closed glass cell structure. It is gas and vapour tight. The close cell structure prevents water penetration or tracking by capillary action. FOAMGLAS® and

its adhesive are vapour tight, providing both an insulation system and high performance vapour barrier in one material.

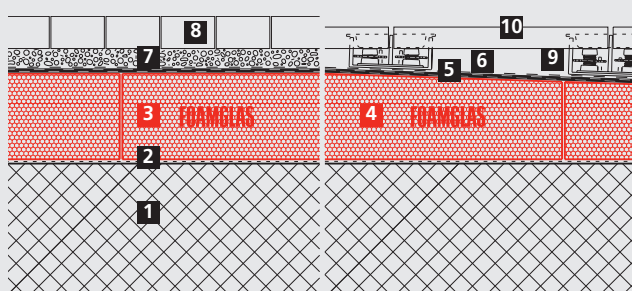
■ Dimensional stability

FOAMGLAS® has a low coefficient of thermal movement, in the same range as concrete and steel, and therefore is simply bonded onto the building structure with adhesive, therefore no thermal bridging, and no corrosion of mechanical fixings.



FOAMGLAS® Compact Roof with membrane waterproofing

- 1 Structure
- 2 Primer coat
- 3 FOAMGLAS® READY BLOCK or
- 4 FOAMGLAS® READY BLOCK TAPERED,
bonded in PC* 500 or PC* 600 Green
- 5 Two layers of bitumen waterproofing membranes,
top layer UV-resistant



FOAMGLAS® Compact Roof with paving slabs or interlocking paving stones

- 1 Structure
- 2 Primer coat
- 3 FOAMGLAS® READY BLOCK or
- 4 FOAMGLAS® READY BLOCK TAPERED,
bonded in PC* 500 or PC* 600 Green
- 5 Two layers of bitumen waterproofing membranes
- 6 Separation / protection layer
- 7 Bedding layer
- 8 Interlocking paving stones
- 9 Support pads
- 10 Paving



- 1 Blackfriars Station, London. Architects: Jacobs, London; 2008 redevelopment.
- 2 Southside, Wandsworth under construction.
- 3 FOAMGLAS® READY BOARD, for fast-track installation.
- 4 FOAMGLAS® boards are suited for use with high-quality EVA/EBA-based synthetic roofing membranes.

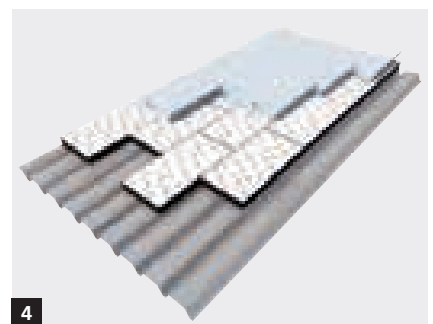
Flat Roofs on Metal Structures

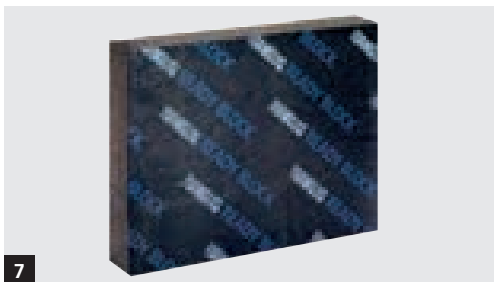
A unique roof board: FOAMGLAS® READY BOARD can be applied with an adhesive to metal decks. This system has excellent resistance to wind uplift and is ideal for buildings with internal high humidity conditions. The advantage is a lightweight, fast track, vapour tight roof with a long service life.

Fast track installation

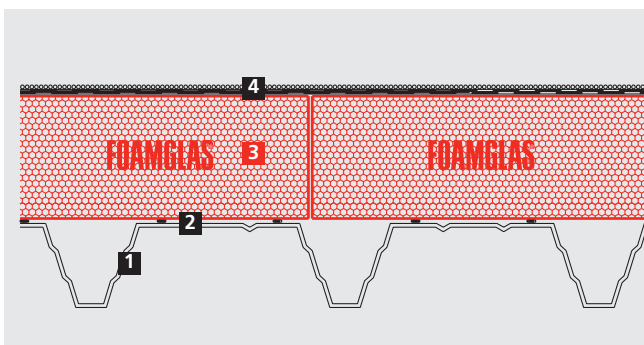
FOAMGLAS® READY BOARD installed on a metal deck with its purpose designed adhesive provides rigidity and a very high resistance to wind load.

The fast installation of the FOAMGLAS® READY BOARD ensures a quicker build program which benefits the contractor and the client alike.



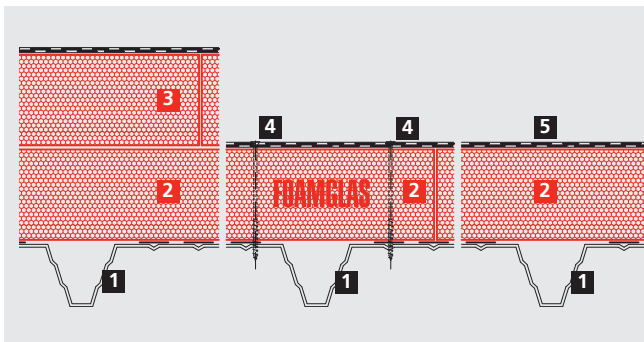


- 5 Ready-Roof cross section.
- 6 FOAMGLAS® READY BOARD, 600 x 1200 mm.
- 7 FOAMGLAS® READY BLOCK, 450 x 600 mm.
- 8 FOAMGLAS® READY BLOCK tapered.



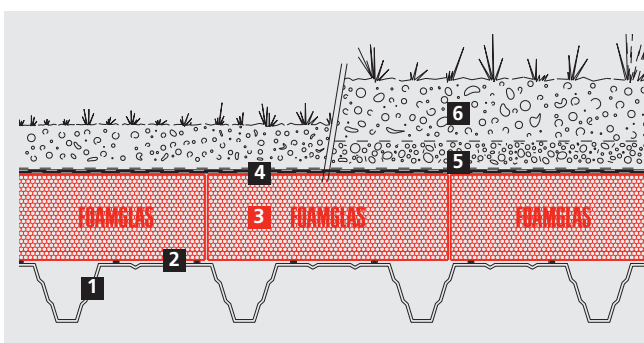
FOAMGLAS® READY BOARD on metal deck

- 1 Metal deck
- 2 Suitable cold adhesive
- 3 FOAMGLAS® READY BOARD, bonded with FOAMGLAS® adhesive
- 4 Waterproofing, 2 layers of torch-on bitumen roofing membrane



FOAMGLAS® ROOF BOARD / READY BOARD on metal deck

- 1 Metal deck
- 2 FOAMGLAS® ROOF BOARD G2 or FOAMGLAS® ROOF BLOCK G1, bonded with adhesive
- 3 FOAMGLAS® READY BOARD or FOAMGLAS® READY BLOCK (in case of multi layer system)
- 4 Waterproofing membrane, mechanically fixed
- 5 Fleece backed waterproofing membrane, bonded with a cold adhesive



FOAMGLAS® READY BOARD on metal deck, Green Ready Roof

- 1 Metal deck
- 2 Suitable cold adhesive
- 3 FOAMGLAS® READY BOARD, bonded with FOAMGLAS® adhesive
- 4 Waterproofing, 2 layers of torch-on bitumen roofing membrane
- 5 Separation or protection layer
- 6 Planting system



Tapered Insulation for Flat Roofs

Where we have a level structure, the cellular glass insulation can be supplied with a tapered top surface to ensure water runs off the roof surface, this is the FOAMGLAS® TAPERED Roof Insulation System.

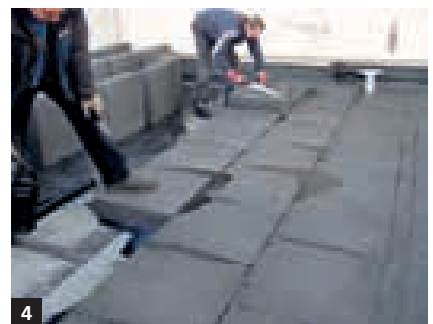
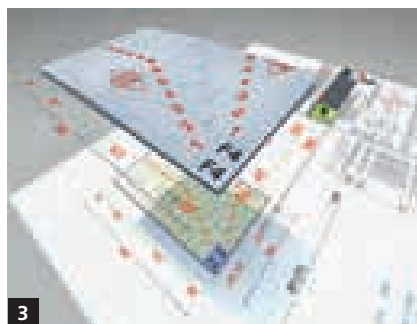
Typically for new build projects, architectural details and drawings are used as the starting point for the proposed design. A detailed site survey may also be required.

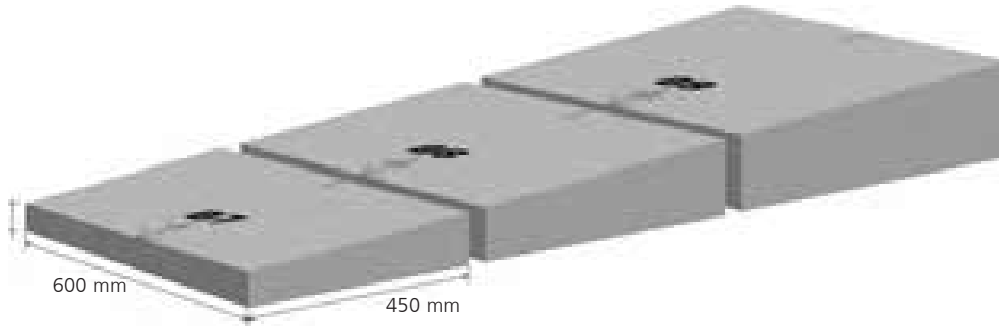
At door thresholds, water outlets and parapets the maximum and minimum heights are taken into account. We consider the slope, the direction of drainage, the locations of gutters and drains, all this is done while ensuring the overall average thickness of the

tapered insulation system meets the required thermal performance.

A design drawing is produced showing the tapered insulation layout, the critical heights and dimensions. During manufacture each block of cellular glass insulation is individually machine tapered, and it is given a unique part number which matches up with its position on the tapered design drawing.

- 1 Lloyds Building.
Office building, London.
Architect: Richard Rogers.
Application: Roof,
FOAMGLAS® T2.
- 2 Primark fashion store,
Edinburgh.
Architecture: 3d Reid,
Manchester.
- 3 Labeling extends down to each FOAMGLAS® TAPERED block and corresponds to the layout drawing.
- 4 The direction of fall is indicated on each FOAMGLAS® TAPERED slab.





Where can I use FOAMGLAS® TAPERED insulation?

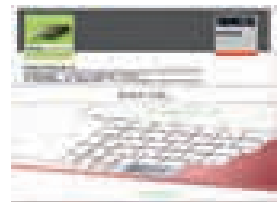
FOAMGLAS® TAPERED insulation is suitable for both new build and refurbishment projects. Older flat roofs get a new lease of life; the thermal performance, water management and drainage is improved.

Gradients / Taper / Falls / Slope

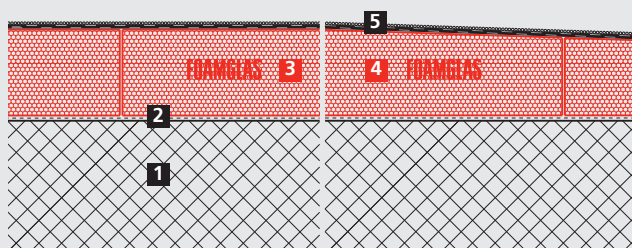
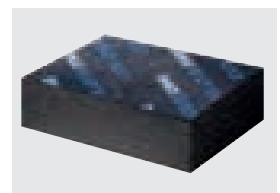
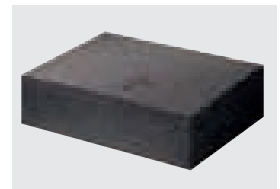
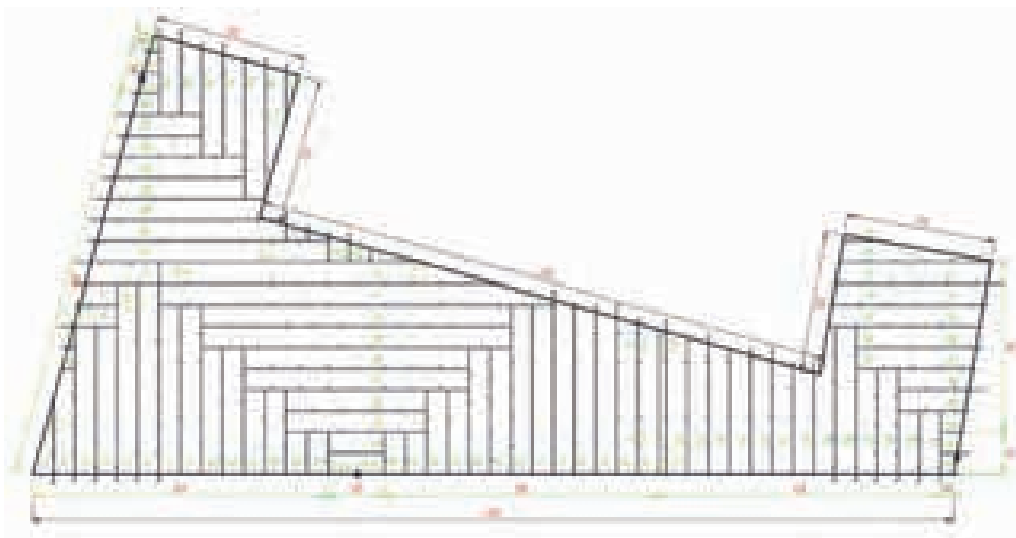
FOAMGLAS® is available in a range of standard tapered slopes, to suit every design situation.

Design assistance

For assistance in designing your FOAMGLAS® TAPERED insulation system, please contact FOAMGLAS®, Pittsburgh Corning UK.



The design drawings are produced using a bespoke CAD system.



FOAMGLAS® TAPERED insulation system

- 1 Structure
- 2 Primer coat
- 3 FOAMGLAS® READY BLOCK or
- 4 FOAMGLAS® READY BLOCK with tapered top surface, bonded in PC® 500 or PC® 600 Green
- 5 Two layers of bitumen waterproofing membranes, top layer UV-resistant



Green Roofs

The FOAMGLAS® green roof can be designed as an intensive or extensive planted system. Depending on the structural conditions it is suitable for concrete, steel or wood decks. Architects choose FOAMGLAS® insulation for their green roof projects because of its unrivaled compressive strength, and for the peace of mind that comes from using this watertight fully bonded roof construction.

Moisture demands on green roofs

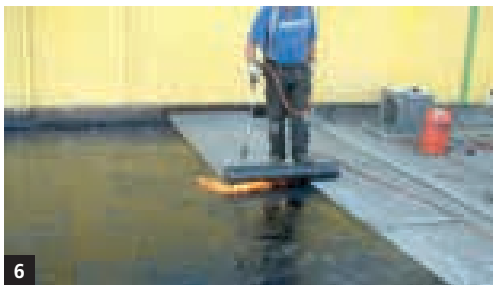
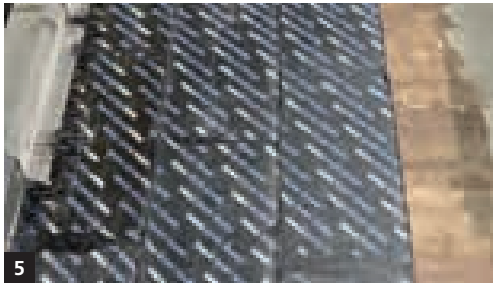
Roofs with planted areas are subject to an increased amount of vapour and moisture. FOAMGLAS® cellular glass insulation is a vapour tight product offering impervious performance to moisture.

A major benefit for vegetated roofs: resistance to roots, pests, fertilizers

FOAMGLAS® insulation is inorganic, which makes it highly resistant to all forms of infestation and vermin. The closed glass cells do not store moisture, it is an effective shield against root penetration; it's also resistant to chemicals, with no risk of fertilizer damaging the insulation.

- 1 Sports hall.
FOAMGLAS® insulation for green roofs.
- 2 FOAMGLAS® green roof on Gateway House 1, Basingstoke, date 1976.
Architect:
Arup Associates, London.
1979 RIBA Award.
- 3 FOAMGLAS® green roof adds beauty and sustainability to new and retrofit rooftops.
Snitterton Hall, Matlock, South Darley.
Bench Architects, Buxton
- 4 Tower Hill Station, London, FOAMGLAS® green roofs, also below paving and sundial to prevent thermal bridging.





- 5 Installed FOAMGLAS® insulation.
- 6 The waterproof membrane is fully bonded.
- 7 Installation of a filter fleece and drainage layer.
- 8 National Maritime, Greenwich, Sammy Offer wing and roof terrace. Architect: Purcell Miller Triton, London.

Plantings

Extensive green roof systems contain low-level foliage and ground-cover plants. There's no need to replicate the soil thickness or the nutrition and irrigation requirements of a real garden. A soil thickness of 50 to 100 mm is sufficient and the plants can even grow on pitched or sloping roofs. For extensive planting systems a falling gradient of at least 1.3% is recommended.

Intensive green roof planting systems are more similar to conventional gardens and require more consideration in terms of soil, nutrition and roof durability. Intensive green roofs typically require a greater soil thickness.

The build-up of a green compact roof from the waterproofing level upward generally includes:

Soil: the planting medium for the plants

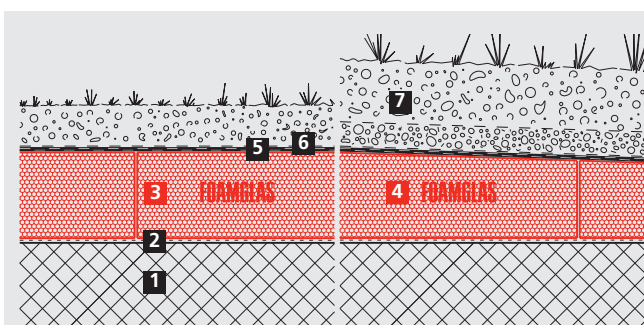
Filter layer: to prevent fine particulate soil from obstructing the drainage layer

Drainage layer: to carry off rainwater or for water retention

Building protection mat: to offer protection against mechanical damage of the anti-root membrane and the roofing sheets

Anti-root membrane: to protect the waterproofing against root penetration (not required as an additional layer, if the waterproofing itself is anti-root).

It is highly recommended to use materials that prevent moisture penetration. Fully bonded, vapour tight and waterproof FOAMGLAS® compact roof systems are the experts choice.



FOAMGLAS® green roof

- 1 Structure
- 2 Primer coat and FOAMGLAS® adhesive
- 3 FOAMGLAS® Slabs, Blocks or Boards or
- 4 FOAMGLAS® TAPERED Blocks or Slabs
- 5 Two layers of bitumen waterproofing
- 6 Separation / protection layer
- 7 Planting system (extensive or intensive)



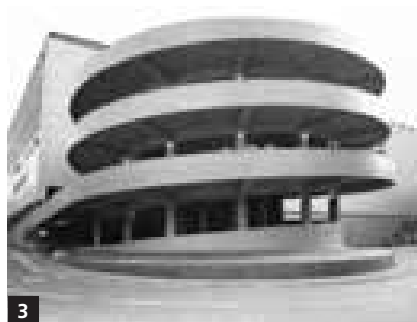
Accessible Roofs for: Terraces, Podium, Vehicles, M & E etc.

Heavy traffic rooftops such as terraces and parking areas experience a great deal of stress from constant load and continual usage. It is crucial that the insulation and waterproofing membrane withstand all static and dynamic loads without deformation. Thermoplastic insulation materials deform gradually over time, diminishing the thermal performance and causing stress to the waterproofing membrane. The compressive strength of FOAMGLAS® cellular glass insulation is one of the highest of any insulating material. There is no risk of deformation, it is a truly structural insulation.

- 1 FOAMGLAS® rooftop parking.
- 2 FOAMGLAS® insulation for the car park of Derwent Hotel, Torquay.
- 3 FOAMGLAS® S3 for car park of West Orchards Shopping Centre, Coventry. Architect: John Clark Associates, London W1P 1FF.
- 4 FOAMGLAS® S3 slabs. Tesco Super Store, Sale, Cheshire.

FOAMGLAS® flat or FOAMGLAS® TAPERED blocks or slabs – for service and parking roofs

FOAMGLAS® has a remarkable compressive strength, it has a very high resistance to edge pressure and does not creep or deform over time.



FOAMGLAS® has remarkable load bearing capabilities when subjected to dynamic movements, such as sheer force from braking and accelerating. Loads can be applied without any deformation of the cellular glass insulation.

■ Roofing membrane

Roofing membranes or asphalt wearing surfaces are directly applied over the insulation creating a 'warm' roof. This ensures a water-proof roofing system is achieved; protecting against water and water vapour penetration.

■ Load distribution slab

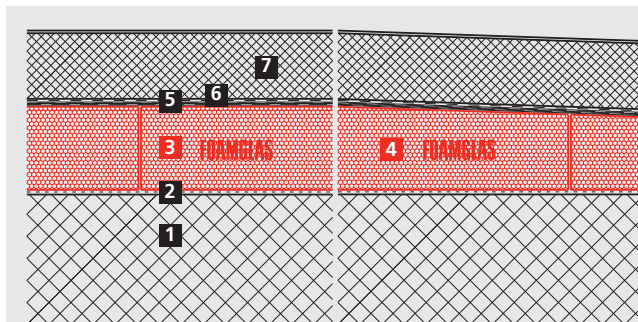
In order to create a robust structure for heavy vehicle parking decks and plazas a load distribution slab may be recommended.

The design of the load distribution slab is dependent on the structural engineers calculations and recommendations.



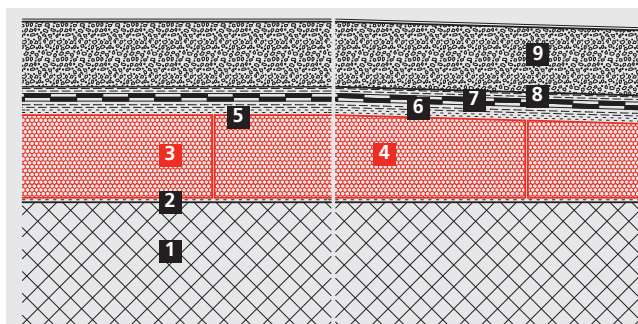
Compression and vapour-proof FOAMGLAS® insulation allows architects and engineers to design using a variety of trafficable finishes:

- Concrete
- Asphalt
- Pavers



FOAMGLAS® roof top car deck

- 1 Structure
- 2 FOAMGLAS® primer coat
- 3 FOAMGLAS® Slabs, bonded
- 4 FOAMGLAS® TAPERED Slabs
- 5 Two layers of bitumen waterproofing membranes
- 6 Separation or slip layer
- 7 In-situ concrete slab



FOAMGLAS® car park roof with asphalt

- 1 Structure
- 2 FOAMGLAS® primer coat
- 3 FOAMGLAS® Slabs, bonded
- 4 FOAMGLAS® TAPERED Slabs
- 5 Bitumen membranes for early waterproofing
- 6 Separation layers (non-woven polyester mat)
- 7 Mastic asphalt waterproofing
- 8 Separation layers (non-woven polyester mat)
- 9 Paving grade asphalt



Metal Standing Seam Roofing

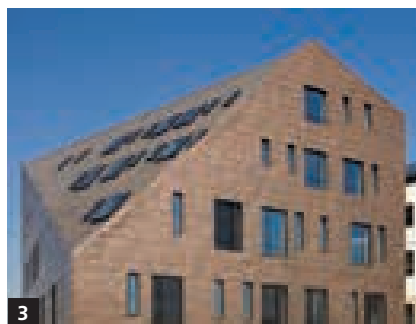
Unusual and striking roof shapes can be achieved using a wide range of materials, including metal. Metal is extremely durable, proven to withstand demanding environments, such as coastal and mountain locations. FOAMGLAS® has developed a unique method of securing the metal roof sheet to the insulation, thus eliminating thermal bridging. Metal roofing combined with FOAMGLAS® is very popular for many projects, ranging from small houses, to boutique hotels, schools and offices. The vapour tight characteristics of FOAMGLAS® make the system particularly suited to high humidity environments such as swimming pools, health spas and leisure centres.

FOAMGLAS® tested by time, with NO thermal bridging

Traditional metal roofs are secured to the structure with many screw fixings, each being a potential thermal bridge. Over the years the

metal will take on a natural patina and removing the roofing system at a later date is highly undesirable. The insulation layer should have a proven reliable performance, this long life expectancy should be equal to the external roof sheet, FOAMGLAS® achieves this.

- 1 FOAMGLAS® READY BOARD, thermally isolated fixing plate. MyPlace Centre, Romford. Architects: Jacobs, London; VM Zinc standing seam roof.
- 2 Heron Tower, Bishopsgate, London. FOAMGLAS® READY BOARD insulation and zinc roofing. Architects: KPF, London.
- 3 FOAMGLAS® for roof and façade beneath KME, Tecu Bronze cladding, The Granary, Barking, East London. Architect: Pollard Thomas Edwards Architects.
- 4 FOAMGLAS® metal roof. FOAMGLAS® READY BOARD with VM Zinc standing seam. Four Seasons Hotel, Park Lane, London. Architects: Eric Parry, London.



Unique fixing system by FOAMGLAS®, for standing seam and for profiled sheet metal

For metal roofs FOAMGLAS® insulation has a unique fixing system. The metal roofing is secured to a metal plate inserted into the upper surface of the FOAMGLAS® insulation, this eliminates the thermal bridge between the metal roof sheet and the building structure. With its ability to withstand high structural loads, its closed cell vapour tight structure and a thermal performance tested by time, FOAMGLAS® is proven to stand the test of time.

Technical features

■ Eliminating thermal bridging

Traditionally metal roofs are secured to the building structure with brackets and screw fixings, these pass through the insulation layer and vapour control layer; each bracket and fixing is a thermal bridge.

FOAMGLAS® cellular glass insulation has a unique fixing system for metal roofing. A plate is inserted into the surface of the FOAMGLAS®, the metal roof fixing brackets are then secured to this plate; there is no thermal path between the metal roof sheet and the structure of the building. Thermal bridging is eliminated.

■ Waterproof

FOAMGLAS® consists of pure glass, it has a truly hermetically sealed, closed glass cell structure. It is gas and vapour tight. The closed cell structure prevents water absorption, penetration or tracking by capillary action.

■ Fire and fumes

FOAMGLAS® consists of pure glass, it is non-toxic, does not combust, support fire, produce fumes, or present a fire risk in the building structure.

■ Vapour control

FOAMGLAS® consists of pure glass, it has a truly hermetically sealed, closed glass cell structure. It is gas and vapour tight. The closed cell structure prevents water penetration or tracking by capillary action.

FOAMGLAS® and its adhesive is vapour tight, providing both an insulation system and high performance vapour barrier in one material.

■ Dimensionally stable

FOAMGLAS® has a low coefficient of thermal movement, in the same range as concrete and steel and is therefore simply adhesive bonded onto the building structure.

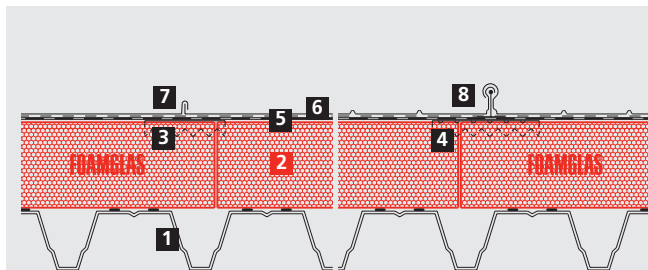
■ Non-toxic

FOAMGLAS® consists of pure glass. It is non-toxic, non-hazardous, it does not contaminate the water table; and is easily cut using hand tools.



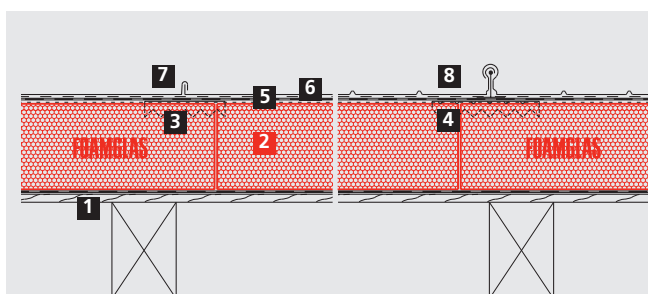
- 5 Fully supported standing seam roofing.
6 Aluminium roofing, e.g. KALZIP.

For advice regarding metal roof finishes, contact:
The Federation of Traditional Metal Roofing Contractors
www.ftmrc.co.uk



FOAMGLAS® Ready-Roof with standing seam roofing on trapezoidal metal deck

- 1 Profiled metal deck
- 2 FOAMGLAS® READY BOARD, bonded in FOAMGLAS® adhesive
- 3 FOAMGLAS® "non-coldbridge" serrated fixing plate PC® SP 150/150
- 4 FOAMGLAS® "non-coldbridge" serrated fixing plate PC® SP 200/200
- 5 Bitumen waterproofing membrane
- 6 Separation layer
- 7 Standing seam metal such as copper, zinc, stainless steel etc.
- 8 Aluminium standing seam



FOAMGLAS® Ready-Roof with standing seam roofing on timber deck

- 1 Timber substrate / multilayer composite board
- 2 FOAMGLAS® READY BOARD, bonded in FOAMGLAS® adhesive
- 3 FOAMGLAS® "non-coldbridge" serrated fixing plate PC® SP 150/150
- 4 FOAMGLAS® "non-coldbridge" serrated fixing plate PC® SP 200/200
- 5 Bitumen waterproofing membrane
- 6 Separation layer
- 7 Standing seam metal such as copper, zinc, stainless steel etc.
- 8 Aluminium standing seam



Façade: Cladding and Rainscreen Systems

FOAMGLAS® cellular glass insulation is ideal for the most demanding wall and façade situations. With its closed cell vapour tight structure and unique capability to dramatically reduce thermal bridging, FOAMGLAS® is an insulation tested by time.

Ecological and time tested thermal performance

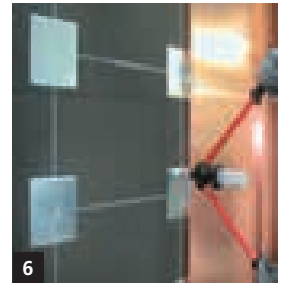
FOAMGLAS® cellular glass insulation is ideal for the most demanding external wall situations. With its closed cell vapour tight structure and its unique capability to dramatically reduce thermal bridging; combined with its permanent thermal performance, FOAMGLAS® is proven to stand the test of time.

Reducing thermal bridging

FOAMGLAS® cellular glass insulation has a unique fixing system for façade and cladding systems. A plate is inserted into the surface of the FOAMGLAS® and secured back to the building structure using thermally isolated fixings. The façade or cladding system is then secured to this plate; there is no thermal path between the façade or cladding system and the structure of the building. The thermal bridging is minimised, air tightness and continuity of the insulation is greatly simplified. The concept improves overall thermal performance.

- 1 FOAMGLAS® insulation on roof and façade. Firstsite Visual Arts Centre, Colchester. Architect: Raphael Viñoly, London.
- 2 FOAMGLAS® façade insulation with "non-cold bridge" fixing plate. Focus House. Bere Architects, London.
- 3 The Granary, Abbey Road, Barking. FOAMGLAS® insulation with sheet metal roofing and cladding. Architect: Pollard Thomas Edwards Architects.
- 4 FOAMGLAS® slabs for cultural centre façade, Kunsthhaus Graz, Austria. Architects: Peter Cook and Colin Fournier.





EQUITONE Rainscreen

EQUITONE is a quality panel for exterior cladding and decorative façades. It is virtually impervious to weather (temperature, UV radiation and humidity). Any contamination, such as graffiti, can be removed quite easily. Because of these advantages, the material with dense molecular coating is quite popular for laboratory surfaces and educational, hospital, and campground facilities.

By installing the FOAMGLAS® façade system the construction works can be reduced, which

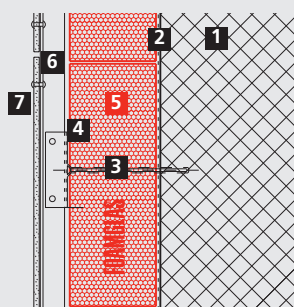
generates less costs.

EQUITONE cladding is fixed back to the FOAMGLAS® using the FOAMGLAS® façade plate.

The EQUITONE FOAMGLAS® system is specified for three reasons:

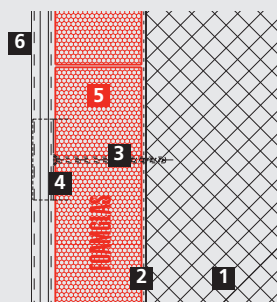
1. Fire safety
2. Speed of installation
3. A dramatic reduction in 'cold bridging' compared to traditional methods of construction.

- 5 FOAMGLAS® W+F slabs, 180 mm, and EQUITONE panels (rainscreen). White Meadows School, Littlehampton. Architects: Seaman Partnership, Chichester.
- 6 FOAMGLAS® façade with standing seam cladding.
- 7 FOAMGLAS® system for flat-locking cassette elements.



FOAMGLAS® façade system with standing seam or profiled metal cladding

- 1 Solid wall (concrete/brickwork)
- 2 Primer coat
- 3 Anchor bolt
- 4 Façade fixing plates PC® SP 150/150, perforated
- 5 FOAMGLAS® Slabs bonded in FOAMGLAS® adhesive
- 6 Substructure (metal/wood)
- 7 Standing seam or profiled metal cladding with fixing brackets/clips



FOAMGLAS® external wall insulation with EQUITONE rainscreen panels (rainscreen)

- 1 Solid wall (concrete/brickwork)
- 2 Primer coat
- 3 Thermally isolated fixing
- 4 FOAMGLAS® fixing plate (PC® SP 150/150)
- 5 FOAMGLAS® Slabs bonded in FOAMGLAS® adhesive
- 6 Exterior cladding panels, composed of woodbased fibres



- 1 Filmmaker Aardman Animations, Bristol. Construction of new headquarters after fire disaster in 2006. FOAMGLAS® application: Facade with timber cladding, floors and roofing. Architects: Alec French Architects, Bristol.
- 2 Clubhouse with timber façade.
- 3 FOAMGLAS® for green homes in Delaware, US. The design combines cutting-edge, energy-efficient construction methods.
- 4 Type of fixings for timber structures.

Timber Rainscreen

With its unique fire qualities FOAMGLAS® cellular glass insulation is an obvious specification for ventilated timber façades.

Technical features

■ High compressive strength

FOAMGLAS® supports high compressive loads without deformation or movement.

■ Fire and fumes

FOAMGLAS® consists of pure glass, it is non-toxic, does not combust, support fire, produce fumes, or present a fire risk to the building structure or the inhabitants within a building.

■ Vapour control

FOAMGLAS® and its adhesive is vapour tight, providing both an insulation system and high performance vapour barrier in one material. It is gas and vapour tight.

■ Waterproof

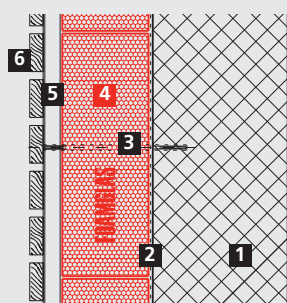
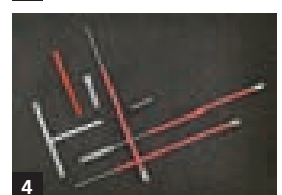
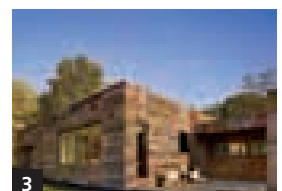
FOAMGLAS® consists of pure glass, it has a truly hermetically sealed, closed glass cell structure. The closed cell structure prevents water absorption, penetration or tracking by capillary action. The insulation can be exposed to weathering in ventilated or open timber façades.

■ Dimensionally stable

FOAMGLAS® has a low coefficient of thermal movement, in the same range as concrete and steel and is therefore simply adhesive bonded onto the building structure.

■ Vermin proof

FOAMGLAS® cannot rot, it is inorganic, it's vermin-proof and cannot support plant growth. It's the ideal choice for locations where the insulation is behind a façade.



FOAMGLAS® insulation for ventilated facade with timber cladding

- 1 Solid wall (concrete/brickwork)
- 2 Primer coat
- 3 Thermally isolated fixing screws
- 4 FOAMGLAS®, bonded with FOAMGLAS® adhesive
- 5 Timber substructure
- 6 Wood cladding

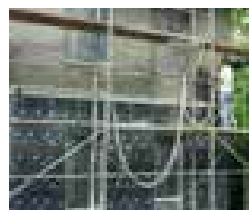
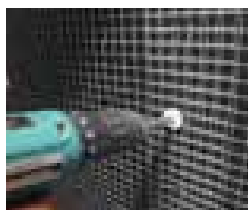
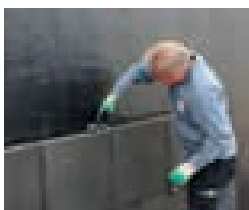


- 1 FOAMGLAS® insulated render façade (EIFS) with natural hydraulic lime.
- 2 Residential building, FOAMGLAS® insulation and lime product.
- 3 FOAMGLAS® insulated render for residential buildings.

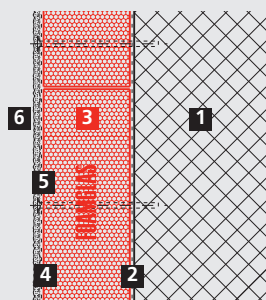
Façade: Insulated Renders

The external walls usually represent a large percentage of the overall surface area of a building and thus are a very important element of the total envelope. Replacing external wall insulation is an extremely costly exercise and therefore the system should provide reliable performance and approved fire safety.

The most ecological and fire tested solution.



Installation sequence for FOAMGLAS® external wall insulation with render.



FOAMGLAS® external wall insulation with a thick layer of mineral render

- 1 Solid wall (concrete/brickwork)
- 2 Primer coat
- 3 FOAMGLAS® Slabs bonded in FOAMGLAS® adhesive
- 4 Topcoat with FOAMGLAS® adhesive
- 5 Reinforcing mesh, mechanically fastened
- 6 Thick layer of render



Underground Structures: Below Ground Walls

It is important to choose an insulation system which will ensure long-term protection of the building and allow full use of the below ground floor levels. The insulation should resist soil pressure and moisture. In combination with a waterproofing system and / or drainage membrane FOAMGLAS® cellular glass provides an excellent risk free system. It is an insulation system and vapour barrier in one material; it prevents water absorption, penetration or tracking by capillary action. Many different systems are available, providing improved performance for waterproof wall constructions and retaining walls.

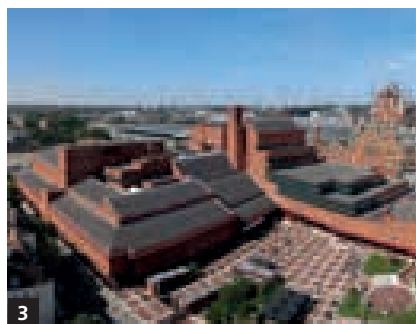
For demanding below ground conditions

Construction below ground is a lengthy and expensive process. The materials used have to withstand compressive loads, and damp conditions. It is important to get the design detail-

ling correct for both the site conditions and the construction process.

FOAMGLAS®, with its closed cell structure, rigidity and proven high compressive strength is ideal for insulating beneath foundations and ground slabs.

- 1 One New Change flagship store, St. Paul's London. Architect: Jean Nouvel. FOAMGLAS® retaining wall insulation. Photo: Paul Riddle
- 2 House with an indoor pool. The below ground walls of the house and the pool are FOAMGLAS® insulated.
- 3 British Library, London. Architect: Sir Colin St. John Wilson. Photo: Patche99z.
- 4 British Embassy in Berlin. The below ground walls are FOAMGLAS® insulated, giving a high resistance to underground conditions. Architect: Ridge and Partners, Oxford.



Technical features (below ground wall and structure)

- Vermin proof
- High compressive strength
- Vapour control
- Waterproof
- Dimensionally stable
- Resistant to organic solvents and acids
- Non-toxic, non-hazardous and does not contaminate the water table.

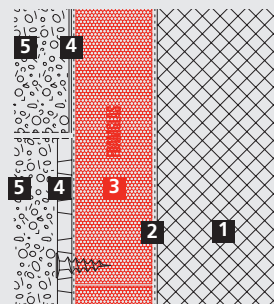
FOAMGLAS® is resistant to the harsh conditions below ground.



The correct design details and specifications are critical when insulating below ground level

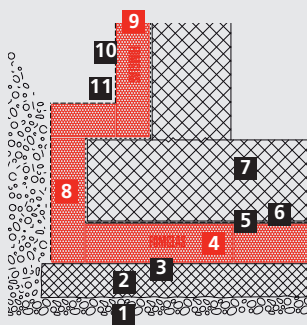


- 5 Below ground walls and M&E plant roof are insulated with FOAMGLAS® READY BOARD.
- 6 Insulation of a retaining wall with FOAMGLAS® boards.



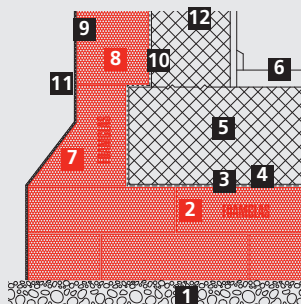
FOAMGLAS® slabs or boards for below ground walls

- 1 Concrete wall (waterproof)
- 2 Primer coat
- 3 FOAMGLAS® READY BOARD, bonded with PC® 56
- 4 Protection layer / cavity drainage membrane
- or alternatively:
a torch applied bitumen waterproofing membrane and protection layer
- 5 Soil / backfill



FOAMGLAS® slabs or boards for below ground structures

- 1 Subsoil or compacted hardcore
- 2 Lean concrete mix
- 3 Levelling compound of chippings, stabilized sand or mortar
- 4 FOAMGLAS® Slabs, bonded in FOAMGLAS® adhesive plus top coat
- 5 Water/dampproofing membrane
- 6 Separation / slip layer
- 7 Concrete slab
- 8 FOAMGLAS® PC® PERISAVE base block, bonded with PC® 56
- 9 FOAMGLAS® READY BOARD, bonded with PC® 56
- 10 Torch applied bitumen waterproofing membrane
- 11 Protection layer / cavity drainage layer



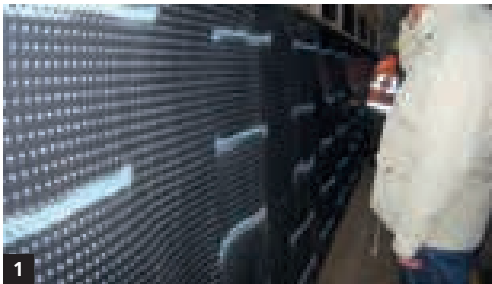
FOAMGLAS® slabs or boards for below ground structures

- 1 Subsoil or compacted hardcore
- 2 FOAMGLAS® Slabs in 2 layers, bonded in adhesive plus top coat
- 3 Water/dampproofing membrane
- 4 Separation / slip layer
- 5 Tanking concrete slab
- 6 Flooring
- 7 FOAMGLAS® PC® PERISAVE marginal stop, bonded with PC® 56
- 8 FOAMGLAS® READY BOARD, bonded with PC® 56
- 9 Thermal bridge-free fixing element
- 10 Full surface FOAMGLAS® adhesive on tanking concrete wall
- 11 Protection layer / cavity drainage layer
- 12 Tanking concrete wall

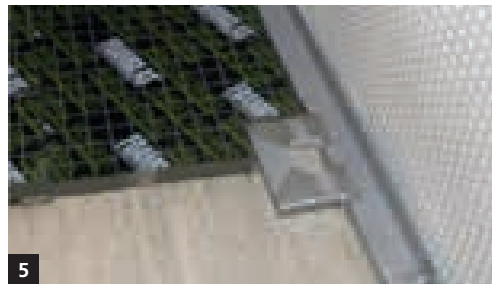
Reducing risk in basement design

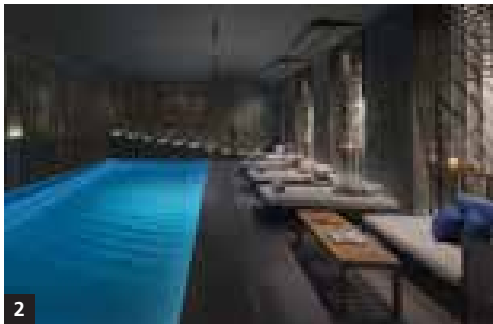
If the drainage membrane dimples compress into the insulation layer, the membrane drainage capacity will be severely reduced (image 3).

With its closed cell structure and high compressive strength without deformation, FOAMGLAS®, cellular glass insulation, provides the ideal solution for supporting the drainage membrane.

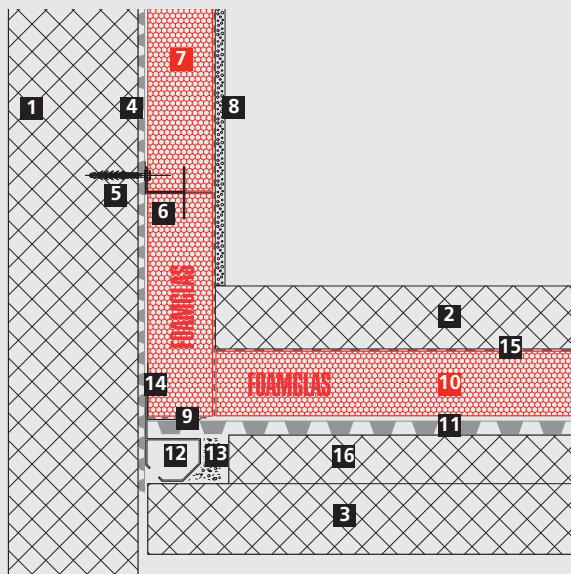


- 1 Dimpled membrane on basement wall.
- 2 FOAMGLAS® cellular glass on an interior wall can eliminate the need for block or stud work.
- 3 Image showing the drainage membrane sinking into an insulation during testing.
- 4 Detail: Dimpled membrane fixed with fixing plug.
- 5 FOAMGLAS® with the drainage channel.
- 6 Below ground community rooms extension to Ansgar Church, Sognegård Odense, Denmark. Architect: CREO Arkitekter A/S, Odense.



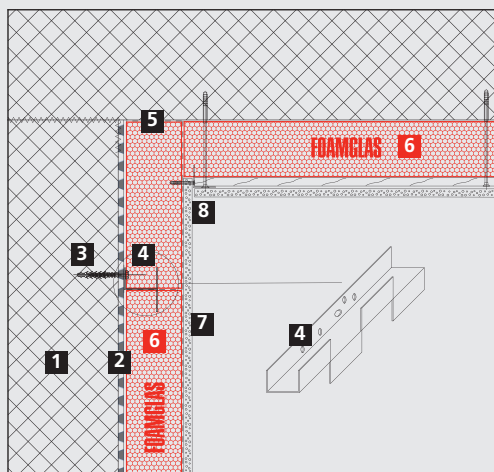


- 1 Basement, city of Munich archives, FOAMGLAS® insulated.
- 2 Spa in basement of Hotel Mandarin Oriental, Milan, Italy; FOAMGLAS® cellular glass for ground slab insulation. Photo: Hotel Mandarin/ George Apostolidis.
- 3 Basement of hospital in Klagenfurth, Austria, FOAMGLAS® insulated. Photo: ©Rainer Wuehrer, Graz/AT.
- 4 Basement design with FOAMGLAS® T4+ thermal insulation for walls and floor.



Basement structure, build-up

- 1 Wall
- 2 Screed
- 3 Reinforced concrete
- 4 Delta-MS500 drainage membrane
- 5 Delta plug+Delta rope (Delta plug driven home with adhesive rope to seal plug back to membrane)
- 6 Insulation fixing PC® F anchor, using size 12 screws
- 7 FOAMGLAS® T4+ (minimum 70 mm), joints sealed with PC® 56 adhesive
- 8 Moisture resistant tapered edges plaster board / Eternit Hydro-panel / Fermacell – Apply three strips of PC® 56 adhesive using 10 mm notched trowel
- 9 Bed insulation in PC® 56 adhesive
- 10 FOAMGLAS® FLOOR BOARD
- 11 Delta-MS20 drainage membrane
- 12 Drainage channel
- 13 20 mm aggregate
- 14 Delta corner strip
- 15 1000 gauge Polyethylene separation membrane
- 16 Sacrificial screed forms perimeter chase for drainage channel



FOAMGLAS® insulation in basement design (applied at the interior)

- 1 Concrete wall, moisture loaded or tanking concrete
- 2 Dimpled drainage membrane (Delta-MS500 drainage membrane)
- 3 Size 12 screw, sealed
- 4 Insulation fixing, PC® F anchor fixed, using size 12 screws
- 5 Bed insulation in PC® 56 adhesive
- 6 FOAMGLAS® T4+ (minimum 70 mm), joints sealed with PC® 56 adhesive
- 7 Moisture resistant tapered edges plaster board / Eternit Hydro-panel / Fermacell – Apply three strips of PC® 56 adhesive using 10 mm notched trowel
- 8 Mechanical fixing of the finish panels at the head, using slotted continuous "L" shaped angle



Underground Structures: Below Ground Floors

Below ground is usually a difficult environment for an insulation, it may be subjected to vermin, water, moisture and high compressive loads. There is only one opportunity to get the specification right; replacing below ground insulation would be extremely costly. High compressive strength FOAMGLAS® cellular glass provides excellent systems for below ground floors and a performance tested by time.

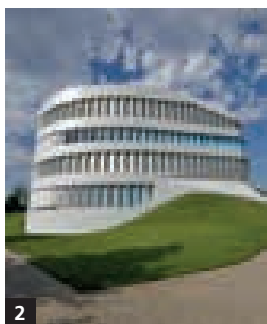
Long lasting insulation performance

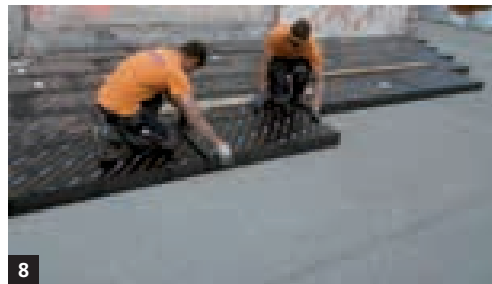
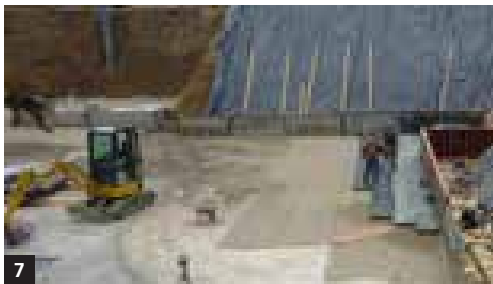
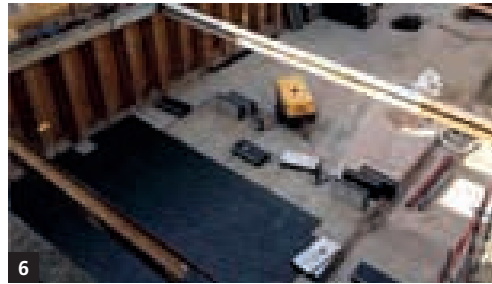
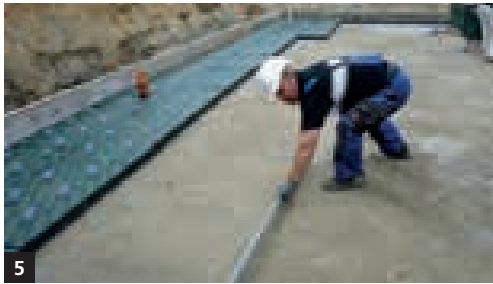
With its ability to withstand high structural loads, its closed cell vapour tight structure and unique ability to reduce thermal bridging. FOAMGLAS® is resistant to the harsh conditions below ground.

Technical features

- Vermin proof
- High compressive strength
- Vapour control
- Waterproof
- Dimensionally stable
- Resistant to organic solvents and acids
- Non-toxic, non-hazardous and does not contaminate the water table.

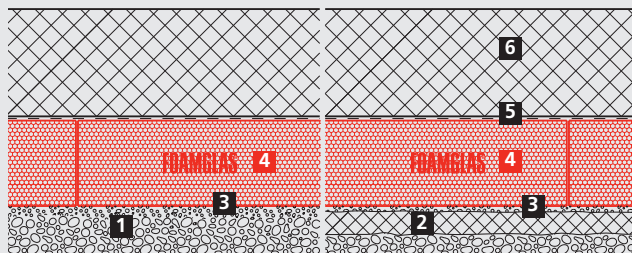
- 1 Wolfson College, Oxford. FOAMGLAS® installed as sub-slab insulation. Architect: Berman Guedes Stretton, Oxford.
- 2 Centre for Virtual Engineering (ZVE), Fraunhofer Institute, Stuttgart, Germany. Architect: UNStudio, Amsterdam: Van Berkel en Bos U.N. ASPLAN Architekten, Kaiserslautern.
- 3 Chelsea Football Club, training facilities. Architect: AFL Architects.
- 4 FOAMGLAS® floor insulation for Watersports Centre, Colwyn Bay; K2 Architects, Liverpool.





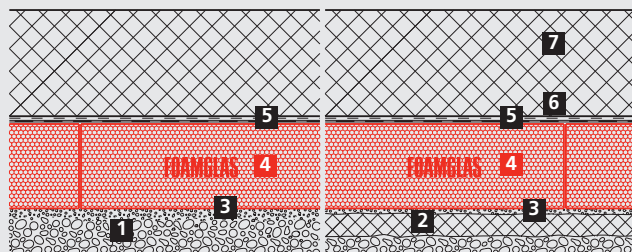
There are different installation methods, depending on soil moisture and groundwater conditions:

- 5 FOAMGLAS® boards with dry joints on a levelling layer of sand.
- 6 FOAMGLAS® boards with sealed joints on lean concrete mix.
- 7 FOAMGLAS® boards on a bed of levelled fine gravel.
- 8 FOAMGLAS® FLOOR BOARD F on a bed of levelled fine gravel, joints sealed.



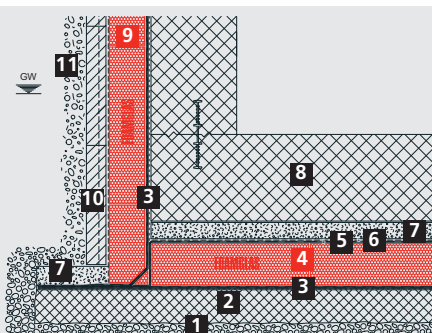
FOAMGLAS® insulation under load bearing structure on lean concrete mix or levelling compound

- 1 Subsoil or compacted hardcore
- 2 Lean concrete mix
- 3 Levelling compound of chippings, stabilized sand or mortar
- 4 FOAMGLAS® FLOOR BOARD insulation
- 5 Separation / slip layer
- 6 Concrete slab



FOAMGLAS® insulation under load bearing structure with waterproofing on lean concrete mix or levelling compound

- 1 Subsoil or compacted hardcore
- 2 Lean concrete mix
- 3 Levelling compound of chippings, stabilized sand or mortar
- 4 FOAMGLAS® BOARD insulation
- 5 Waterproofing
- 6 Separation / slip layer
- 7 Concrete slab



FOAMGLAS® slabs or boards for below ground structures

- 1 Subsoil or compacted hardcore
- 2 Lean concrete mix
- 3 Bitumen compatible waterproofing membrane
- 4 FOAMGLAS® F Slab insulation, bonded in FOAMGLAS® adhesive
- 5 Top coat of FOAMGLAS® adhesive
- 6 Separation / slip layer
- 7 Protective concrete screed
- 8 Concrete slab
- 9 FOAMGLAS® BOARD insulation, adhesive bonded
- 10 Protection layer/cavity drainage membrane
- 11 Soil / backfill



Interiors: Walls, Floors and Soffits

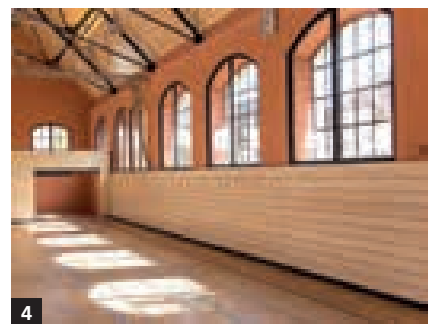
For new build or interior refurbishment FOAMGLAS® cellular glass insulation offers the specifier reliable solutions for every internal environment, including steam rooms, spas and swimming pools. The specific FOAMGLAS® system minimises thermal bridging, provides air tightness, vapour control and a performance tested by time.

The insulation for walls, soffits and floors

FOAMGLAS® cellular glass insulation has the ability to withstand high structural loads; its closed cell vapour tight structure and its time tested thermal performance.

FOAMGLAS® systems have been developed for interior walls, soffits and floors.

- 1 FOAMGLAS® interior insulation on walls. Science Centre, Wolfsburg, Germany. Architect: Zaha Hadid Architects, London. Photo: phaeno.
- 2 British Museum extension, London. Architect: Rogers Stirk Harbour & Partners, London.
- 3 Three Quays Building, London. Axis Architects, London.
- 4 Sports and assembly hall of a college, FOAMGLAS® wall insulation.



Technical features

■ High compressive strength

FOAMGLAS® supports high compressive loads without deflection or movement. It is the ideal insulation material for load bearing areas, such as internal floors for heavy storage or vehicle parking.

■ Fire and fumes

FOAMGLAS® consists of pure glass, it is non-toxic, does not combust, support fire, produce fumes, or present a fire risk to the building structure.

■ Waterproof

FOAMGLAS® has a truly hermetically sealed, closed cell, glass structure. It is gas and vapour tight. The closed cell structure prevents water absorption, penetration or tracking by capillary action.

■ Vapour control

FOAMGLAS® is gas and vapour tight. FOAMGLAS® and its associated adhesives provide both an insulation system and high performance vapour barrier in one material.

■ Dimensionally stable

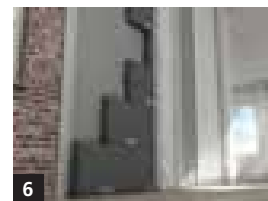
FOAMGLAS® has a low coefficient of thermal movement, in the same range as concrete and steel. It is simply adhesive bonded onto the building structure.

■ Non-toxic

FOAMGLAS® is non-toxic, non-hazardous, and is easily cut using hand tools.

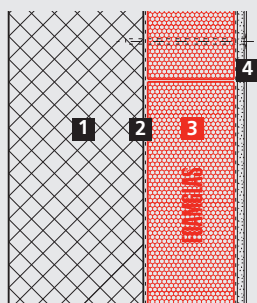


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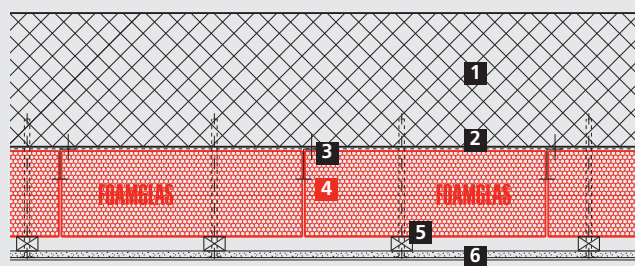
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- 5 Vapour proof FOAMGLAS® internal wall insulation for spas and swimming pools.
- 6 FOAMGLAS® cellular glass insulation is a natural mineral product, meeting health, indoor-air and quality requirements.



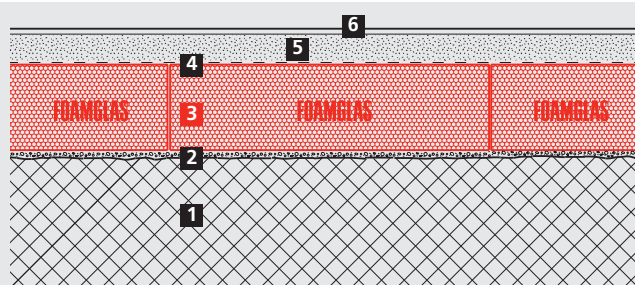
FOAMGLAS® interior wall insulation with plasterboards / fibre reinforced boards

- 1 Solid wall (concrete/brickwork)
- 2 FOAMGLAS® primer coat
- 3 FOAMGLAS® Slabs, bonded in FOAMGLAS® adhesive
- 4 Plasterboards / fibre reinforced boards bonded with a FOAMGLAS® adhesive and mechanically fixed with thermally isolated fixings



FOAMGLAS® soffit insulation with plasterboard or panels mounted on timber or metal substructure

- 1 Concrete deck
- 2 FOAMGLAS® primer coat
- 3 FOAMGLAS® hidden fixings
- 4 FOAMGLAS® Slabs, bonded in FOAMGLAS® adhesive
- 5 Timber / metal substructure mechanically fixed with thermally isolated fixings
- 6 Panelling



FOAMGLAS® interior floor insulation on levelling compound with screed

- 1 Concrete slab
- 2 Levelling layer
- 3 FOAMGLAS® FLOOR BOARD, loosely laid
- 4 Separation layer
- 5 Screed
- 6 Floor finish



High Humidity Buildings, Hot and Cold: Reducing the Risk of Interstitial Condensation

FOAMGLAS®, Cellular Glass insulation, with its typical closed glass cell structure has reassured both building owners and specifiers alike for well over fifty years.

Internal temperature and humidity have significant effects upon the design of the building structure. Standard FOAMGLAS® roof, walls and floors designs are proven to work in all building designs, irrespective of the environmental conditions.

Condensation

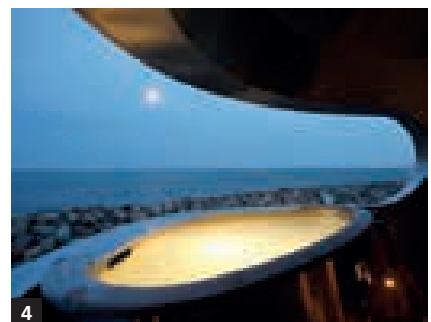
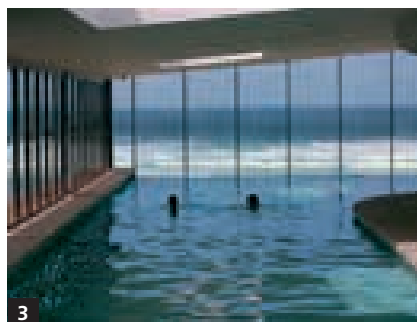
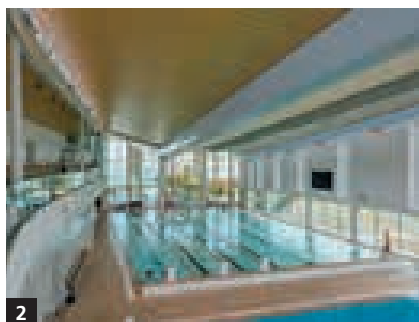
Buildings prone to high humidity are always at a high risk of interstitial condensation, this risk can lead to expensive and inconvenient building refurbishments. Internal water vapour always attempts to migrate through to the exterior of a building. If the moisture remains as interstitial conden-

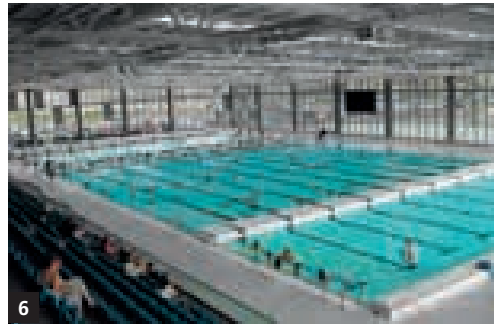
sation within the structure, it significantly reduces the thermal performance of the building.

The causes of interstitial condensation

- Poor installation of vapour control layers, causing moisture vapour to pass into the structure.
- Insufficient insulation causing the dew point to occur within the structure, so increasing the risk of interstitial condensation.
- Presence of penetrating mechanical fastenings (thermal bridge).
- Gradual loss of thermal performance, due to thermal ageing.

- 1 Interior wall application, Hotel Sackmann, Wellness & Spa, Baiersbronn, Germany. Architect: Albert Vögele, Freudenstadt. Photo: Hotel Sackmann
- 2 Splash Point Leisure Centre, Worthing. Wilkinson Eyre Architects, London.
- 3 Watergate Bay Hotel, Newquay.
- 4 Sauna at a Vacation Home on "Easter Island", Kaitene, Latvia. Architects: Zaiga Gaile, Agnese Sirmā.





Gyms, spas and cold rooms are usually a difficult environment for both insulation and vapour control. FOAMGLAS®, cellular glass insulation, can provide

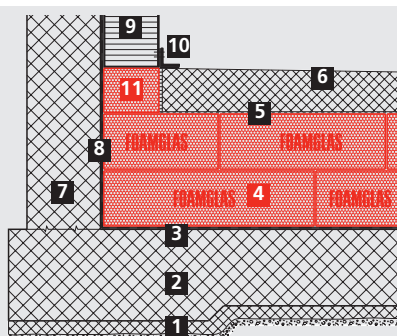
- High compressive strength
- Dimensional stability
- Resistance to chemicals and acids
- Vapour control
- Waterproofing capability
- Tested by Time thermal performance



- 5 High humidity environment in a Health Spa.
- 6 Cardiff International Pool. S & P Architects, London. Photo: Welsh Government, Llywodraeth Cymru.
- 7 Roof application, Four Seasons Hotel, London. Roof for Health Spa. Architects: Eric Parry, London.
- 8 Floor application, cold store warehouse floor.

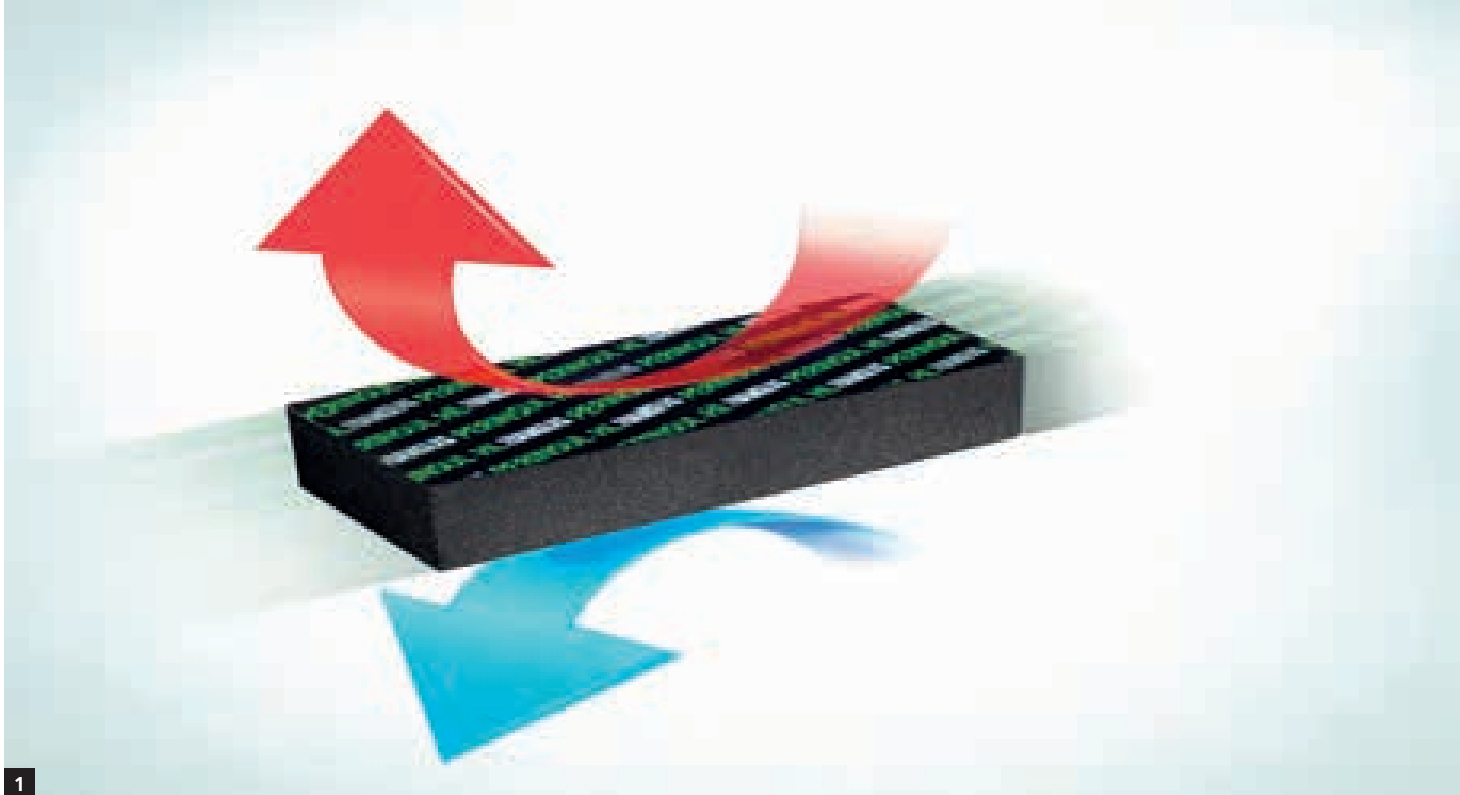
Reducing Risk within a Cold Store Environment

The design considerations for a cold store are unusual. With a significant temperature difference between internal and external, control of the dew point is very important. There are large racks of heavy boxes, trucks and forklifts also drive over the refrigerated floor. If the insulation were to compress the floor could crack. The resulting repairs and downtime would be extremely costly. FOAMGLAS® with its load bearing capability and, superior vapour control offers the ideal solution.



Detail of the build-up for cold store warehouse floor

- 1 Subsoil and lean concrete mix
- 2 Foundation slab
- 3 Bitumen compatible waterproofing membrane
- 4 FOAMGLAS® F Slab insulation and FLOOR BOARD F, 2 layers, adhesively bonded
- 5 Separation / slip layer
- 6 Load distribution concrete slab, reinforced, with cooling equipment
- 7 Concrete wall
- 8 Raised bitumen compatible waterproofing membrane
- 9 Steel faced sandwich panel
- 10 Angle iron on sealing tape
- 11 FOAMGLAS® edge insulation



Reducing Thermal Bridging in Load Bearing Conditions: Inner and Outer Wall Leaf, Parapets, Thresholds etc.

FOAMGLAS® PERINSUL HL reduces thermal bridging in many load bearing conditions including door and window sills. It is important to consider all potential thermal bridges. Current studies show that even in new buildings, thermal bridging in load bearing conditions remains a problem.



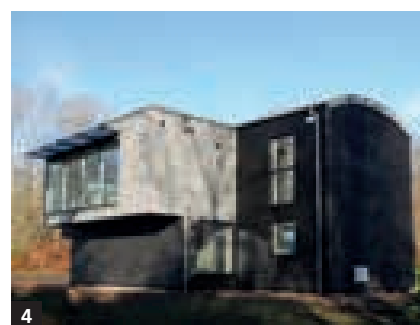
FOAMGLAS® PERINSUL HL, the insulation that thinks it's a brick

European Technical Approval, ETA-13/0163
BBA Certificate 14/5111

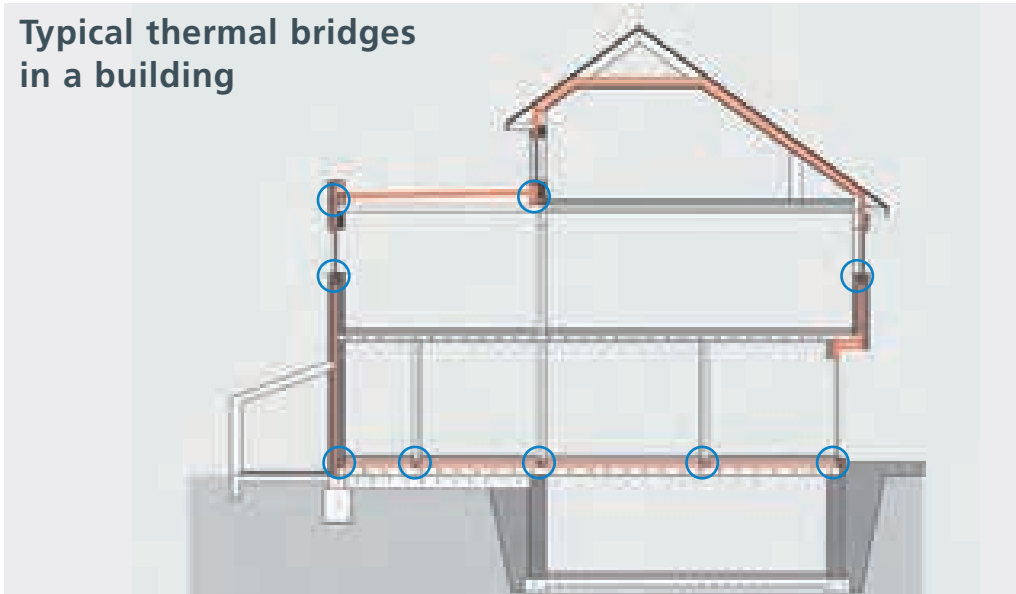
Use load bearing FOAMGLAS® PERINSUL HL

To eliminate thermal bridges, the horizontal and vertical insulation layers should meet, however in this unique location, the insulation will be subjected to significant compressive loads. FOAMGLAS® cellular glass insulation easily supports uniformly distributed compressive loads without moving or flexing. FOAMGLAS® PERINSUL HL is positioned beneath the structural load, linking the horizontal and vertical insulation layers, thus eliminating the thermal bridge.

- 1 FOAMGLAS® PERINSUL HL prevents thermal bridging.
- 2 Dogs Trust Rehoming Centre, Loughborough. Architects Peter Napier & Co., Shrewsbury.
- 3 Residential homes in Cambridge.
- 4 Cuttens Barn, Tonbridge, Kent. A self-build timber frame home, adopting Passivhaus standards, using FOAMGLAS® Perinsul HL.



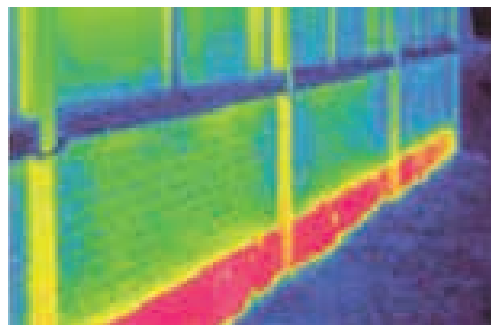
Typical thermal bridges in a building



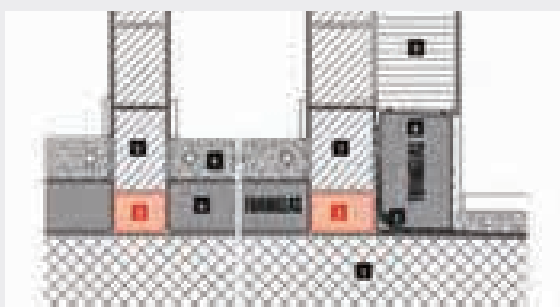
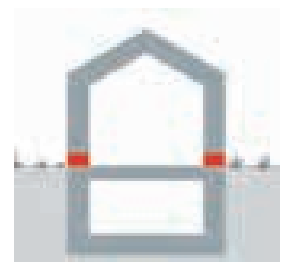
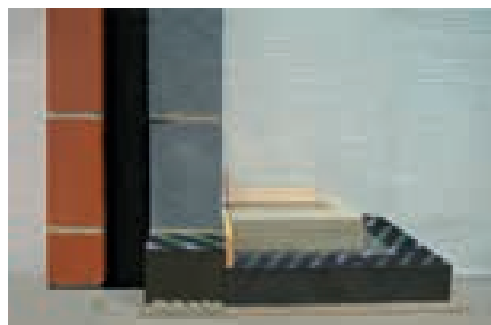
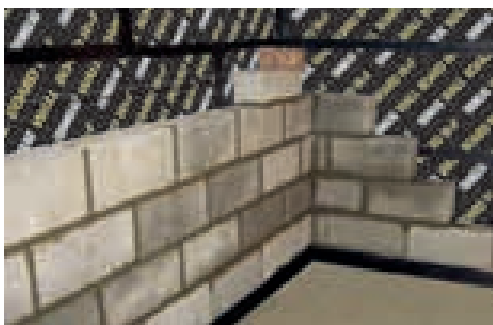
All applications have to be considered regarding design load and local requirements. For specific approvals etc. please read the ETA and BBA certificates, and FOAMGLAS® Perinsul HL technical literature.



- European Technical Approval, ETA-13/0163
- BBA Certificate 14/5111
- Fire Testing Certificates



FOAMGLAS® PERINSUL HL thermal break can be used beneath common types and sizes of masonry and prefabricated walls. It is an intelligent solution to avoid heat loss in passive house and traditional construction.



FOAMGLAS® PERINSUL HL, load bearing insulation: typical application

- 1 Concrete structure
- 2 DPC, damp course, can be dressed above or below FOAMGLAS® Perinsul HL
- 3 FOAMGLAS® PERINSUL HL, bedded in mortar
- 4 FOAMGLAS® floor insulation
- 5 Internal wall
- 6 Screed
- 7 External wall
- 8 FOAMGLAS® insulation to the lower wall
- 9 Exterior insulation



- 1 Perinsul HL provides continuous insulation at the base of a timber frame.
- 2 Refurbishment of apartment houses using PERINSUL HL, terrace project, Brussels, Belgium. Architects: LD2 Architecten, Brussel; Photo: Marc Detiffe
- 3 Terrace project, interior view of apartment. Photo: Marc Detiffe



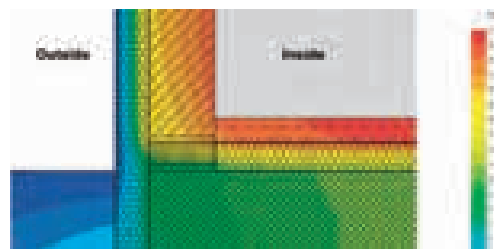
Timber Frame Construction with FOAMGLAS® PERINSUL HL

FOAMGLAS® PERINSUL HL at base of timber frame

Timber frame is a well-established construction method. Thermal bridging at the base of the timber structure affects both the wall and floor insulation zones. The effect of the thermal bridge is far greater than the surface area of the thermal bridge.

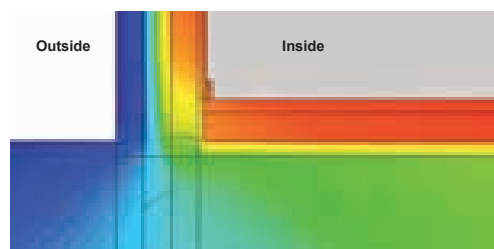
Good design detailing ensures continuity of the insulation thus providing energy efficient buildings. With its high compressive strength and dimensional stability Perinsul HL offers the perfect solution for reducing thermal bridging in load bearing conditions.

**Energy efficiency =
Design it right, Build it right.**



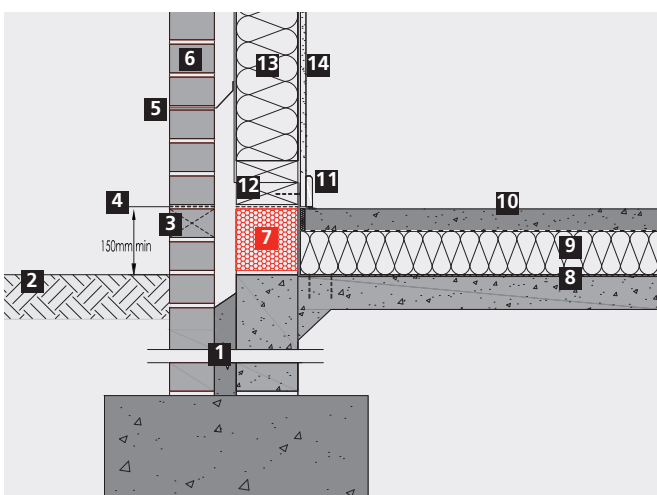
With PERINSUL HL

Typical detail showing Perinsul HL at the base of a wall. The thermal image shows a warm (yellow/orange) temperature.



Without PERINSUL HL

Typical detail showing masonry at the base of the timber wall. The thermal image shows a lower (blue/green) surface temperature.



Typical detail showing Perinsul HL at the base of a timber frame

- 1 Concrete fill
- 2 Exterior ground level
- 3 Open perpend at 1.5 M maximum
- 4 Dpc (damp proofing course)
- 5 Wall tie
- 6 Brickwork cladding
- 7 FOAMGLAS® PERINSUL HL, 140 mm thickness on min. 10 mm mortar bed
- 8 Dpm (damp proofing membrane)
- 9 Floor insulation
- 10 Internal screed
- 11 Sole plate fixing strap
- 12 Sole plate
- 13 Insulated timber frame wall
- 14 Internal lining



Green roof and public terrace

Tower Hill Underground Rail Station, London

Architects Austin Smith Lord

Owner Transport For London

Main contractor Molwem

Construction 1986-1988

FOAMGLAS® application Roof, FOAMGLAS® S3 cellular glass insulation, 1,240 m²

Finish Extensive planting, public seating and roof terrace

Tower Hill underground rail station sits adjacent to London's Roman Wall and a short walk from the City's major tourist attraction, the Tower of London. With extensive planting, public seating and roof terrace; Architects Austin Smith Lord ensured this busy station would be both a pleasure for visitors, and blend into the landscape.

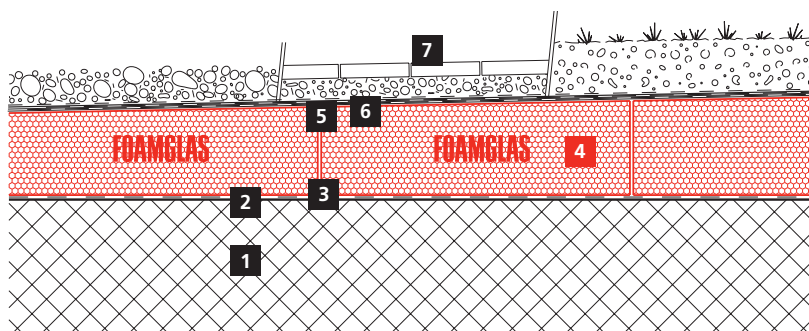
This building required some unique insulation features. The client needed a non-combustible insulation with a proven long term thermal performance, there was heavy foot traffic, and tremendous compressive loads from bronze sundial

sculpture upon the roof. FOAMGLAS® insulation meets all these specifications and with its purpose made adhesive is both an insulation and vapour control layer in one unique system.

As part of a redevelopment in 2015 parts of the Tower Hill station have been refurbished. After 28 years of continuous use the FOAMGLAS® S3 insulation is still in place, it remains in excellent condition and does not need repair or replacement.

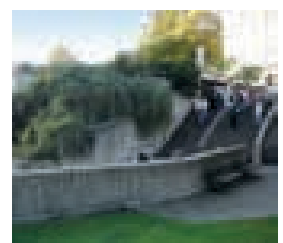
The FOAMGLAS® insulation has proved to be an excellent investment, and a very wise specification by Architects Austin Smith Lord.

FOAMGLAS®, in excellent condition after 28 years of continuous use
www.foamglas.com



Build-up

- 1 Concrete slab, 200 mm
- 2 Primer coat
- 3 Adhesive
- 4 FOAMGLAS® S3 slabs
- 5 Separation layers and mastic asphalt
- 6 Root barrier
- 7 Garden and terrace areas with bronze sundial sculpture





Roof refurbishment

Victorian Residences, Matthew Allen Properties, Stoke Newington

Architects Project 5 Architecture, London

Contractor Kingsbury Construction

Construction 1874-1875, refurbishment 2009-2014

FOAMGLAS® application Roof, FOAMGLAS® TAPERED, slab T4+

Finish Asphalt

Leading up to the 1870's London had an extreme housing shortage. Local builder Matthew Allen was granted permission for a new housing scheme in Manor and Bethune Roads, Stoke Newington.

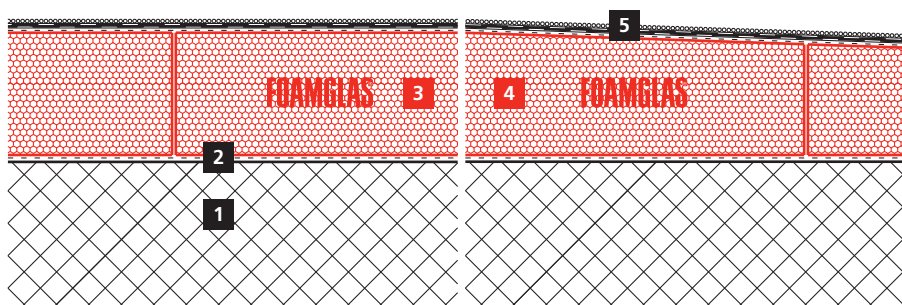
Allen's approach was a completely new; he successfully introduced the concept of a single architecturally pleasing building; divided into a series of apartments; each with its own private entrance. In 1875 Building News magazine praised Allen's buildings for their vista, economy, internal arrangements, ventilation, physical and acoustic privacy. The RIBA said "Mr Allen has successfully solved the difficult problem of providing affordable private housing with a pleasing exterior".

Project 5 Architecture and Kingsbury Construction have now almost completed the full refurbishment and interior modernisation of these buildings.

Waterproofed with asphalt, the flat roofs and balconies are visually the same. To reduce weight upon the 140 year old structure bespoke manufactured TAPERED FOAMGLAS® insulation replaces the original concrete screeds; ensuring the roofs shed water and are fully walkable for easy maintenance. With excellent thermal performance and proven long term reliability, FOAMGLAS® insulation ensures Mr Allen's properties will remain comfortable and energy efficient for today's residents and future generations.

Proven performance and energy efficient, FOAMGLAS® TAPERED insulation

www.foamglas.co.uk



Build-up

- 1 Concrete roof deck
- 2 Primer coat
- 3 FOAMGLAS® Slabs or
- 4 FOAMGLAS® TAPERED Slabs, laid in hot bitumen
- 5 Asphalt waterproofing





Roof, FOAMGLAS® TAPERED

Shard Tower, level 75, Building Maintenance Platform, London

Design Architects Renzo Piano Building Workshop

Executive Architects Adamson Associates, London

Main Contractor Mace; **Roofing Contractor** AC PLC

Construction 2012

Application Roof, FOAMGLAS® TAPERED, slab T4+

Finish Bitumen membranes

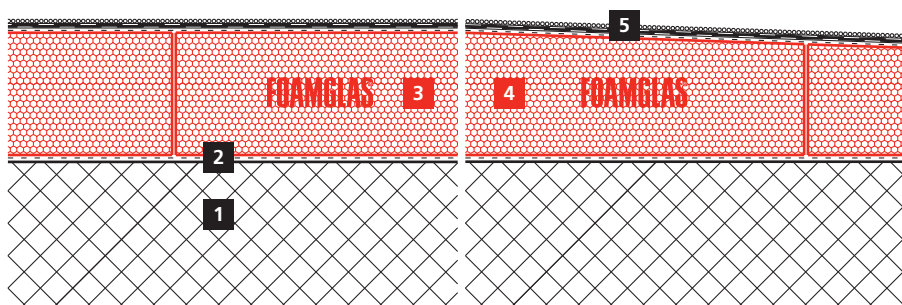
At 310 m, Shard Tower currently holds the title of Western Europe's tallest building; exposed to extremes of temperature the revolutionary structure sways up to 50 cm in high winds. The building maintenance platform on level 75 is located directly above the viewing galleries, and essentially forms the Shard's roof. To shed water, the flat metal platform required an insulation with a tapered top surface. In this extremely exposed location, and with significant loads upon the platform, a truly reliable solution was needed. FOAMGLAS® insulation combines compressive strength, long-term insulation performance, and is available with a pre-cut taper in the upper surface. Using our "in house"

CAD systems, FOAMGLAS® designed a bespoke Tapered Insulation system. Taking full advantage of its low coefficient of expansion, and to reduce thermal bridging, FOAMGLAS® and its membranes were adhesive bonded onto the metal structure. The unique ability of FOAMGLAS® to withstand high compressive loads ensures regular maintenance work can be safely carried out without damage to the insulation or the membranes.

Adamson Architects commented on this project: "FOAMGLAS® has proved itself to be the ultimate solution for the difficult loadbearing areas of the Shard. Specifying cellular glass insulation ensured complete integrity and performance in key areas of the Shard Tower."

FOAMGLAS® TAPERED – outstanding technical and environmental credentials

www.foamglas.co.uk



Build-up

- 1 Metal structure
- 2 Adhesive
- 3 FOAMGLAS® Slabs
- 4 FOAMGLAS® TAPERED Slabs, adhesive bonded
- 5 Bitumen membranes





**Pedestrian
access
courtyards
and piazzas**

Pedestrian Terrace and Vehicle Access, Barbican Centre, London

Architect Chamberlin, Powell and Bon, London

Construction 1982

FOAMGLAS® application Compact roof, approx. 10,000 m²,
FOAMGLAS® S3, 50 mm thick, in hot bitumen

Finish Paviers

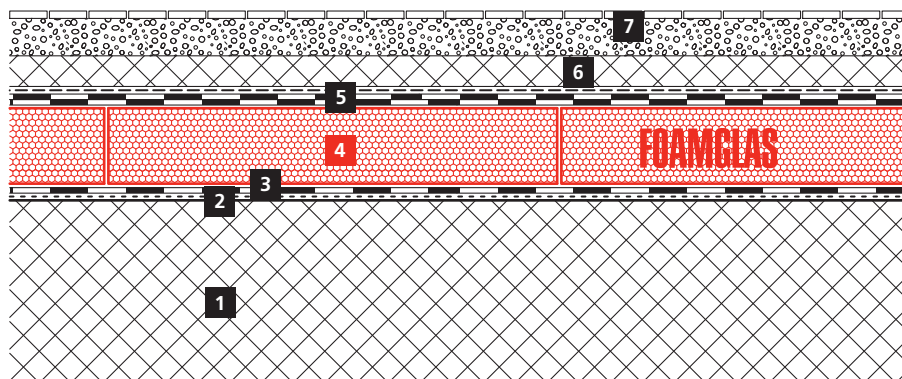
Barbican Centre in the City of London is a residential, commercial and performing arts centre, it has an array of buildings which has pushed the forefront of architecture. The centre is the largest of its type in Europe and despite its construction many years ago, the centre continues to attract many visitors from around the world not only for its arts and performances but its 1970's Brutalist Architecture.

The client, City of London Corporation, is the third largest arts funder in the United Kingdom.

At a cost of £161 million, the centre was a gift to the nation and was opened by Queen Elizabeth II on the 3rd March 1982.

In 2001 the Barbican Complex became a Grade II listed building.

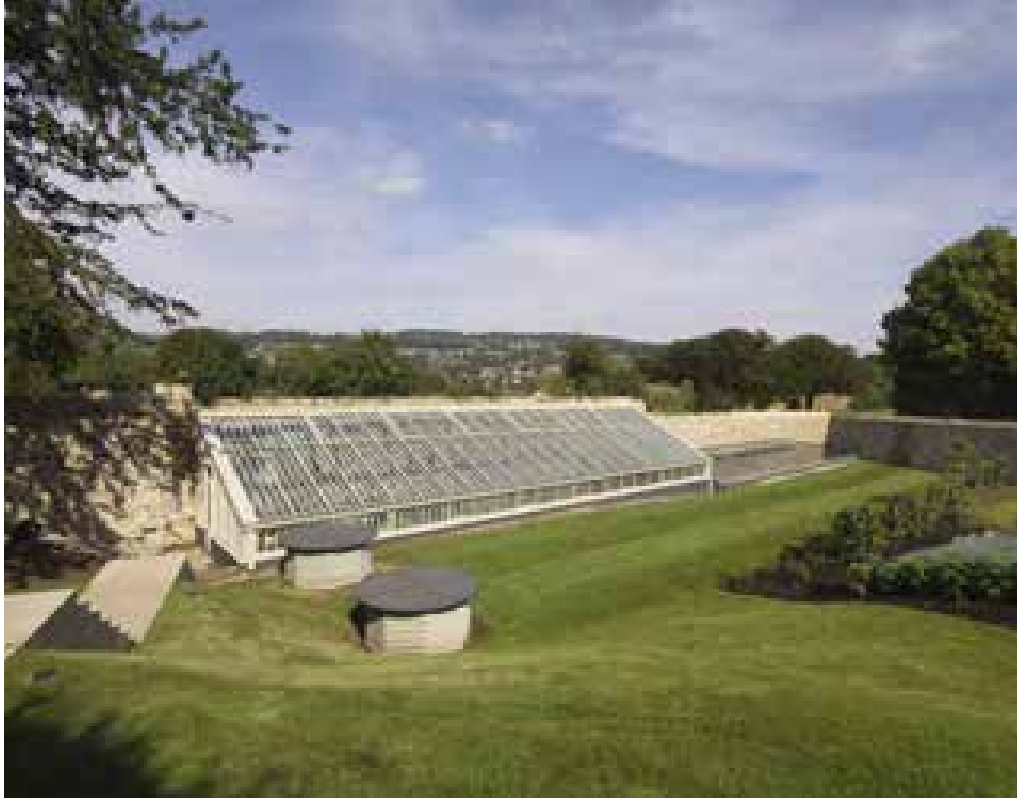
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roof is made to last**
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Buildup

- 1 Concrete structure
- 2 Bituminous primer
- 3 Bitumen waterproofing
- 4 FOAMGLAS® S3, 50 mm, compact roof system, in hot bitumen
- 5 Waterproofing – two layers, modified bitumen membrane, adhered by hot bitumen
- 6 Protection concrete screed
- 7 Paviers on bedding layer





Compact green roof system

Snitterton Hall, Matlock – South Darley, Derbyshire

Client Paul Caplan

Architects Bench Architects, Buxton, www.bencharchitects.co.uk

Roofing contractor Green On Top; **Contractor** G F Tomlinson, Derby

Construction 2012

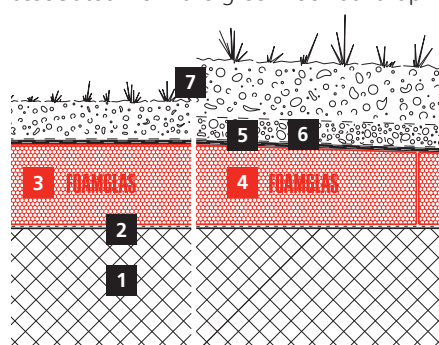
FOAMGLAS® application Green Roof Insulation, FOAMGLAS® READY BLOCK T4+

Snitterton Hall is a privately owned Grade 1 listed building in the heart of Derbyshire. Using traditional materials and craftsman-ship methods, this important historical house has been carefully restored to its former splendour. The addition of a new subterranean swimming pool provides a modern contrast with the entrance, leading from the late Elizabethan-Jacobean style gardens into the reinstated mid-18th to early-19th century glasshouse. The ground floor features an entrance lobby area, mezzanine with balconies and planters to the north and south walls with edge lighting to the glass fronts. A staircase provides access to the subterranean pool level comprising stainless steel pool, sanitary spaces and the plant room. In order to allow access for the building works to take place, the dismantling and reconstruction of the grade II listed curtilage wall was a central element of the works, containing both the structure and services to the pool. Every stone was labelled, stored and meticulously reinstated to its original position. To eliminate risk from interstitial condensation, FOAMGLAS® TAPERED T4+ was spe-

cified to insulate the concrete deck above the subterranean swimming pool and glasshouse stonewall detail.

Installed with fully sealed joints, using bitumen based cold applied adhesive, the all glass, closed cell FOAMGLAS® insulation does not allow for the passage of water vapour and prevents the nuisance of interstitial condensation, associated with high risk buildings such as swimming pools.

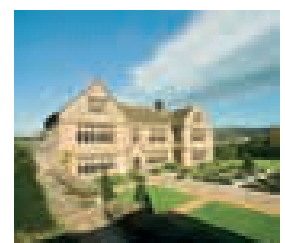
The FOAMGLAS® TAPERED T4+ insulation does not compress or deform under load; offering compressive strength of 600 kPa, the compact roof system fully supports the primary waterproofing layer and the loads associated from the green roof build-up.



Vapour proof
FOAMGLAS® insulation
supports
green roof system
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Build-up

- 1 Concrete roof deck
- 2 Primer coat
- 3 FOAMGLAS® READY BLOCK or
- 4 FOAMGLAS® READY BLOCK TAPERED, adhesive bonded
- 5 Two layers of bitumen waterproofing membranes
- 6 Separation / protection layer
- 7 Planting (extensive or intensive)





Metal cladding, roof and façade

Photos © Tim Crocker

The Granary, Abbey Road, Barking

Client Roof Ltd; **Local Area Master Plan** Schmidt Hammer Lassen Architects

Architects Pollard Thomas Edwards Architects

Structural Engineers Price & Myers; **Contractor** Roles Broderick Roofing Ltd

Construction 2010-2012

FOAMGLAS® application Roof, FOAMGLAS® READY BOARD T4+, 200 mm thick; Façade, FOAMGLAS® W+F blocks, 150 mm thick, mechanically fixed

Cladding KME, Tecu Bronze to BS EN 1172

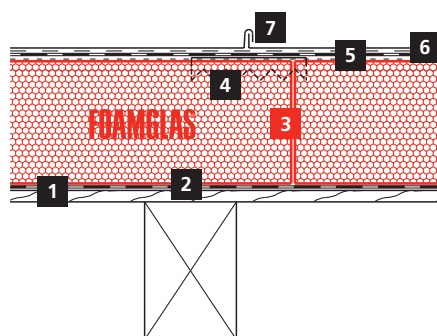
The grade II-listed 120-year-old Granary building and the Malthouse are among the oldest buildings within the East London district of Barking and Dagenham. In 2009 the redevelopment master plan was prepared by Schmidt Hammer Lassen Architects. Design for the Granary and Malthouse was carried out by Pollard Thomas Edwards Architects, which certainly achieved the client's key requirements for sustainability and energy efficiency. Steve Drury, Roof development director, commented: "At an early stage FOAMGLAS® insulation was specified for its environmental qualities and long-term reliability. It is impervious to water and water vapour, and it actually provided an element of exterior weather-proofing as the building works progressed." Interior works could commence while the metal façade was still being installed.

FOAMGLAS® insulation, with its unique cladding fixing system, kept thermal bridging to a minimum; the resulting U-value performance exceeds Building regulations by more than 25%. With time the KME Tecu Bronze exterior will take on a natural

patina. The metal exterior has a potential lifetime of well over 200 years, so it's crucial to use an insulation with a proven long-term thermal performance.

With FOAMGLAS® thermal aging does not take place. It is the ideal insulation to combine with roof and façade materials such as KME Tecu Bronze.

For the pitched roof FOAMGLAS® READY BOARD T4+ was bonded and sealed to the wood deck with PC® 11 adhesive. Metal plates type PC® SP 150/150 were inserted into the FOAMGLAS® READY BOARD. A 180 g/m² sanded bitumen membrane was torch-applied onto the surface.



World Architecture News, Winner 2011.

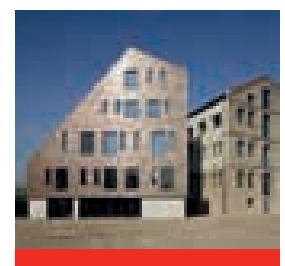
New London Awards, Winner 2012.

Civic Trust Awards, Winner 2012.

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Buildup

- 1 Wood substrate
- 2 Separation layer nailed on or self-adhesive layer
- 3 FOAMGLAS® READY BOARD T4+, adhesive bonded and sealed
- 4 Metal plates PC® SP 150/150
- 5 Sanded bitumen membrane, torch-applied
- 6 Separation underlay
- 7 KME Tecu Bronze: 0.7 mm thick; pre-formed interlocking large format shingles, spec DIN EN CuSn 4, secured with stainless steel clips and screws to the PC® SP 150/150 metal plates





Façade, open screen cladding

Photo © Bruce Damonte

Dream Downtown Hotel, New York

Client Hampshire Hotels & Resorts, LLC

Architect Handel Architects, LLP

Exterior Wall Consultant Front Inc

Reconstruction 2010

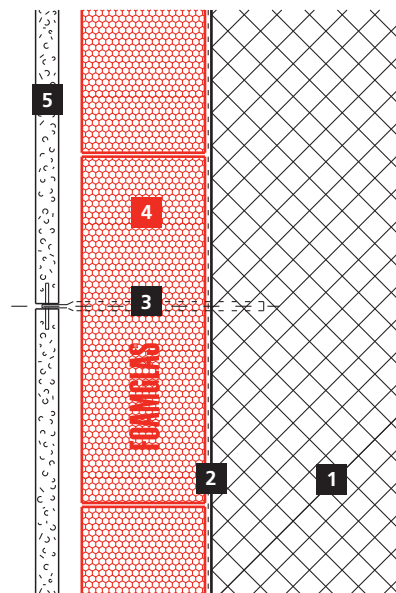
FOAMGLAS® application Façade, FOAMGLAS® T4+ slabs, 2 in./3 in.

Cladding Curtain wall with custom, round windows

Located in the Chelsea neighborhood of New York City, the Dream Downtown Hotel is a 12-story 184,000 sq ft building. It includes 316 guest rooms and many amenities.

The building was originally designed in 1966 for the Maritime Union, which incorporated porthole windows. The façade (rainscreen) was designed to expand on this concept.

FOAMGLAS® insulation was chosen to be applied to the wall substrate behind the façade for several reasons. It can be exposed to UV and the elements; it has high dimensional stability; it is non-combustible; it will not absorb moisture and it is able to act as an air barrier when the joints are sealed. Its proven high sustainability was also a factor.



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performs behind
open screen cladding**
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Buildup

- 1 Solid wall
(concrete/brickwork)
- 2 Primer coat
- 3 Resin anchor
- 4 **FOAMGLAS® Slabs,**
adhesive bonded
- 5 Large format open screen
cladding elements





**Façade,
timber
cladding**

Aardman Animations, Bristol

Client Filmmaker Aardman Animations

Architects Alec French Architects, Bristol

Construction 2006

FOAMGLAS® application Façade, floors and roofing

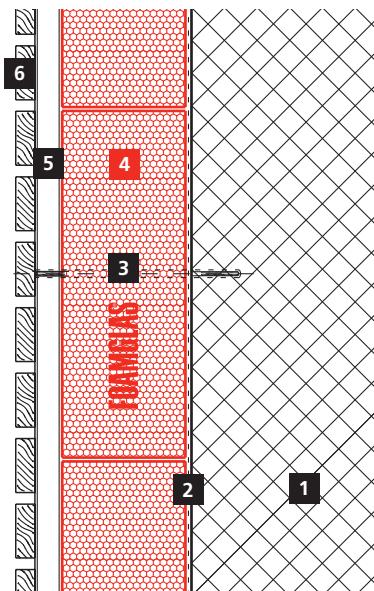
FOAMGLAS® T4+ slabs

Cladding Timber

On the 10th October 2005 a fierce warehouse fire destroyed the archives of Aardman Animations; the creators of the much-loved Wallace and Gromit films. In 2006 work started on the new worldwide headquarters for the company. With its unique fire qualities FOAMGLAS® cellular glass insulation was an obvious and reassuring specification for the ventilated timber façade and flat roofs.

The FOAMGLAS® façade system has been developed to reduce thermal bridging caused by fixings and brackets, minimising the heat loss from the external envelope.

FOAMGLAS® and its adhesive provide a high level of vapour, water and airtight performance. This cellular glass insulated façade ensures a long term, efficient and fire safe building.



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building – a cutting-
edge energy efficient
construction**
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Buildup

- 1 Solid wall (concrete/brickwork)
- 2 Primer coat
- 3 Thermally isolated fixing screws
- 4 FOAMGLAS® Slabs, bonded in FOAMGLAS® adhesive
- 5 Timber substructure
- 6 Timber cladding





Below ground, underslab insulation

Photo © Axis 3 Design

Porsche Centre, Solihull, West Midlands

Client Porsche GB

Architects Axis 3 Design Ltd., Warwick

Groundworks contractor MED Building Services; **Contractor** Talbot Construction

Construction 2011

FOAMGLAS® application Floor insulation,
loadbearing FOAMGLAS® FLOOR BOARD F, 50mm thick

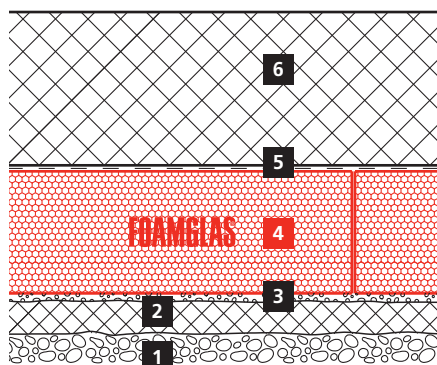
A new Porsche Centre opened in February 2012, on the southern outskirts of Solihull. The state-of-art development, featuring a 36-car showroom, is one of the largest Porsche Centres in the UK and represents a significant investment in both, the Porsche business and the local area. The distinctive showroom features a customer specification lounge in which visitors can personalise their car, a coffee bar serves as a central social hub for visitors to the Centre and a 'heritage wall' displays the rich history of Porsche, to make the stories behind the car come alive.

The workshop is equipped with 10 bays, plus a dedicated bay for a new MOT service and a Direct Dialogue facility for on-the-spot diagnosis, as well as a cosmetic repair service and tyre fitting area.

Axis 3 Design specified FOAMGLAS® FLOOR BOARD F as an underslab insulation to satisfy the target U-value requirement and eliminate thermal bridging within the foundation detail to meet Building Regulations. Due to the high loads, associated with the workshop and showroom areas, a total of 2500m²

FOAMGLAS® FLOOR BOARD F at 50mm was specified and installed.

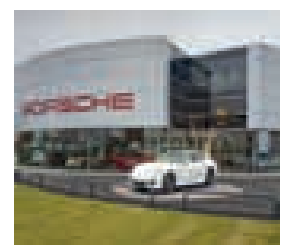
Kevin Conlon of project architects Axis 3 Design, explains the decision to specify the product: "We selected FOAMGLAS® for its inherent durability and high compressive strength," explains architect Kevin Conlan at Axis 3 Design, "This made it ideal to use as underslab and perimeter insulation. Its primary function is to act as insulation, but with the additional advantage of there being absolutely no risk of water absorption."



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Build-up

- 1 Subsoil or compacted hardcore
- 2 Lean concrete mix
- 3 Levelling compound
- 4 **FOAMGLAS® FLOOR BOARD, loosely laid**
- 5 Separation layer
- 6 Concrete slab





Below ground, retaining wall insulation

Photo: Paul Riddle

One New Change, Office and Flagship Stores

Architects Jean Nouvel

Client Land Securities plc

Main Contractor Wates Building Group

Construction 2008

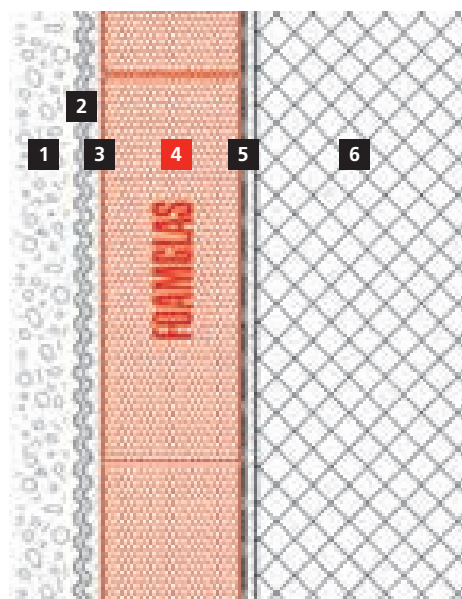
FOAMGLAS® application Retaining walls, FOAMGLAS® WALL BOARD T4+, 80 mm

One New Change is a contemporary building with a total of eight floors, comprising offices on the top four floors, a public terrace at roof level on the sixth floor, and shops on the lower ground, ground and first floor.

With around 60 stores spanning the three floors, One New Change is one of the largest shopping centres in central London, rivalling other London shopping hot-spots. A panoramic lift in the middle gives direct access to new and exciting views over St. Paul's Cathedral dome.

This iconic building has been designed by Pritzker Prize-winning architect, Jean Nouvel. The modernist building has 6,500 floor-to-ceiling glass panes in varying shades of red, grey and beige, flooding the floors with natural light. 4,300 of which are unique pieces.

One New Change helps to restore Cheapside to its rightful place as one of London's great commercial thoroughfares and the City mall is playing a leading role in the transformation of the City into a seven-day shopping and leisure destination.

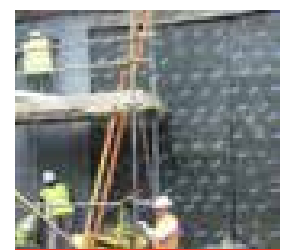


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structures**

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Buildup

- 1 Soil/backfill
- 2 Protection layer
- 3 Primer coat
- 4 **FOAMGLAS® WALL BOARD T4+, bonded with PC® 56**
- 5 Bitumen waterproofing
- 6 Concrete wall





Interior insulation, soffit

Photos © Bench Architects

Snitterton Hall, Matlock – South Darley, Derbyshire

Client Paul Caplan

Architects Bench Architects, Buxton, www.bencharchitects.co.uk

Internal lining contractor ALD Group; **Contractor** G F Tomlinson, Derby

Construction 2012

FOAMGLAS® application Soffit insulation, FOAMGLAS® WALL BOARD T4+, 50 mm thick

Snitterton Hall is a privately owned Grade 1 listed building. Using traditional materials and craftsmanship methods, this important historical house has been carefully restored to its former splendour.

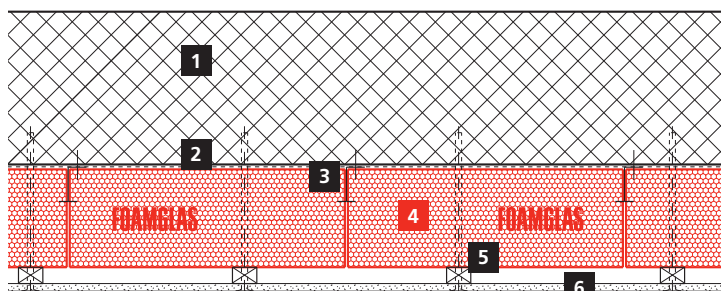
The addition of a new subterranean swimming pool provides a modern contrast with the entrance, leading from the Elizabethan-Jacobean style gardens into the reinstated mid-18th to early-19th century glasshouse. The ground floor features an entrance lobby area, mezzanine with balconies and planters to the north and south walls with edge lighting to the glass fronts. A staircase provides access to the subterranean pool level and the plant room.

To eliminate risk from interstitial condensation, FOAMGLAS® WALL BOARD T4+ was specified to insulate the concrete soffit above the subterranean swimming pool.

Installed with fully sealed joints using PC® 56 cold applied bitumen based adhesive, the hermetically sealed cellular glass structure of FOAMGLAS® WALL BOARD T4+ does not allow for the passage of water vapour and prevents the nuisance of interstitial condensation, associated with high risk buildings such as swimming pools.

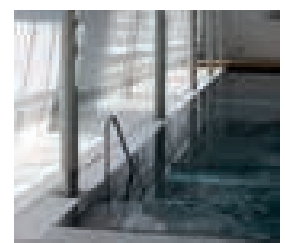
A timber ceiling support system was employed to provide a secondary fix for the insulation layer and support the appropriate internal lining boards for high humidity applications.

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Build-up

- 1 Structure
- 2 Primer coat
- 3 Mechanical fastening with anchors PC® F
- 4 FOAMGLAS® WALL BOARD T4+, bonded in cold adhesive PC® 56
- 5 Timber/metal substructure, mechanically fastened
- 6 Panelling



FOAMGLAS® in Great Britain

ARTS AND CULTURE: Pallant Gallery, Chichester. New Globe Theatre, London. Bernie Grant Centre, London. Bristol Industrial Museum. Time & Space Greenwich. National Maritime Museum, Greenwich. Royal & Derngate Theatre, Northampton. RSC Stratford Upon Avon. Kew Gardens Botanic Gallery, Richmond, London. Scottish Ballet, Scotland. Kew Gardens, London. First Site, Colchester. Oxford Castle, Oxford. Turner Contemporary, Margate. Royal Submarine Museum, Gosport. Weald and Downland Museum, Sussex.

HISTORICAL BUILDINGS: Palace of Westminster, London. Buckingham Palace, London. Tower of London, London. Kentwell Hall, Suffolk. Tate Gallery, London. British Museum, London. Somerset House, London. Downside Abbey, Somerset. Ashmolean Museum, Oxford. Snitterton Hall, Matlock. Nanteos Mansion, Aberystwyth.

RETAIL: Southside Shopping Centre, London. Howard Centre, Welwyn Garden City. Parkway Shopping Centre, Newbury. Fortnum and Mason, London. Smithfield Market, London. Primark, Edinburgh. Somerfield, Cowes, IOW. Billingsgate Market, London. C+A, Bournemouth. Porsche Cars, Solihull.

OFFICE: The Granary, Barking. Telehouse West Docklands. CP4 Docklands. Olivers Yard, London. Eland House, London. Regis House, London. One New Change, London. Welcome Trust, London. Co-Op Head Office Building, Manchester.

AIRPORT: Gatwick Airport, Crawley. Heathrow Airport, Hounslow. Manchester Airport Control Tower. East Midlands Airport, Castle Donington, Derby.

LONDON UNDERGROUND: Tower Hill, Stockwell. Shepherds Bush, Barbican. Stratford (Admin Offices). Embankment, Blackfriars. Farringdon. Temple. Southwark. Wood Lane. Kingsbury. White City (Admin Offices), Paddington. Farringdon Station, London. Wimbledon Park Station, London. Wembley Park Station, Wembley. Temple Tube Station, London. Southwark Tube Station, London.

NATIONAL RAIL: Kings Cross, London. Blackfriars, London. Paddington, London. London Bridge. Barnet, London.

HOTELS AND RESTAURANTS: Ritz Hotel, London. Ivy Restaurant, London. Four Seasons Hotel, Park Lane, London. Claridges, London. Marriott Hotel, Heathrow. Costa, London. Clements Inn, London. Holiday Inn, London. Rudding Park Hotel, Harrogate.

RESIDENTIAL: Roule Estate, Bermondsey. Accordia, Cambridge. Allen Estate, Stamford Hill. William Blake House, London. Canning Town Estate, London. Chute House, London. Canada Estate, Rotherhithe. Rowley Estate, London. Westminster Apartments, London. Marquis Estate, London. Camp Road, St Albans. Silchester Estate, London. Chester Balmore, Camden. Alder Carr Farm, Ipswich, Suffolk. The Log House, East Harling.

EDUCATION: Wadham College, Oxford. Skinners School, London. London Fields School. Southampton University. James Allen Girls School, London. University of Westminster, London. Ealing Territory College, London. Perse School, Cambridge. Eton College, Eton. Cardiff University, Cardiff. Trinity School, Newbury. Oxford University, Oxford. Wolfson College, Oxford. Solihull College, Solihull, West Midlands. Woodlands Campus, Solihull. Malvern College, Malvern, Worcestershire. Newcastle University, Newcastle upon Tyne. Elliston School, Amalgamation Cleethorpes. Richmond Hill School, Leeds. Dixons Allerton Academy, Bradford. St Mary Magdalene School, Willesden. Brecknock School, London. Hornsby House School, Balham - London. Hills Road College, Cambridge. Marylebone School, London. Rossington School, Doncaster. St Winifred's School, Southampton. Westminster City College, London. Finton House School, London. Langham School, Langham. London School of Economics, London. Royal School of Music, London. Ladbroke Grove Day School, London. Southampton University, Southampton. Ysgol Dyfryn, North Wales. Downside Abbey School, Bath. Somerset Imperial College, London.

HOSPITAL: St Barts, London. University College Hospital, London. Royal Marsden Hospital, London. Guys Hospital, London. St Thomas Hospital, London. King's College Hospital, London. Princess Margaret Hospital, Windsor. BUPA, Basingstoke. Worthing Hospital, Worthing. Royal Star and Garter Home, Richmond. RMH, Manchester. Royal Liverpool University Hospital, Liverpool.

LOCAL AUTHORITY: Birmingham City Council Office, Birmingham.

MANUFACTURING: Roche Pharmaceuticals, Welwyn. Ford, Research & Development, Dunton. SCA, Aylesford. Anheuser Busch, London. Royal Mail Sorting Office, Guernsey. Nine Elms Sorting Office, London.

GOVERNMENT: Cabinet Office, London. Scottish Parliament, Scotland. RM, Chivenor. Bletchley Park, Milton Keynes. Bournemouth Police Station, Bournemouth. Colindale Police Station, Hendon. Hendon Police Station, Hendon. Wandsworth Fire Station, London. Melton Mowbray Fire Station, Melton Mowbray - Leicestershire. Wandsworth Prison, London.

SPORTS & LEISURE: Aquatic Centre, London. 2012 Velodrome, London. Worthing Aquarena, Worthing. K2 Crawley. Cardiff Aquatic Centre. Lord's Cricket Ground, London. Wentworth Golf Club, Wentworth. Oval, London. Aquatics Centre, Aberdeen. Jarrow Swimming Pool, Jarrow. Morley Leisure Centre, Morley. Armley Leisure Centre, Armley.

ENTERTAINMENT: Roundhouse, London. Curzon Street, London. Nottingham Hub Metroplex, Nottingham.

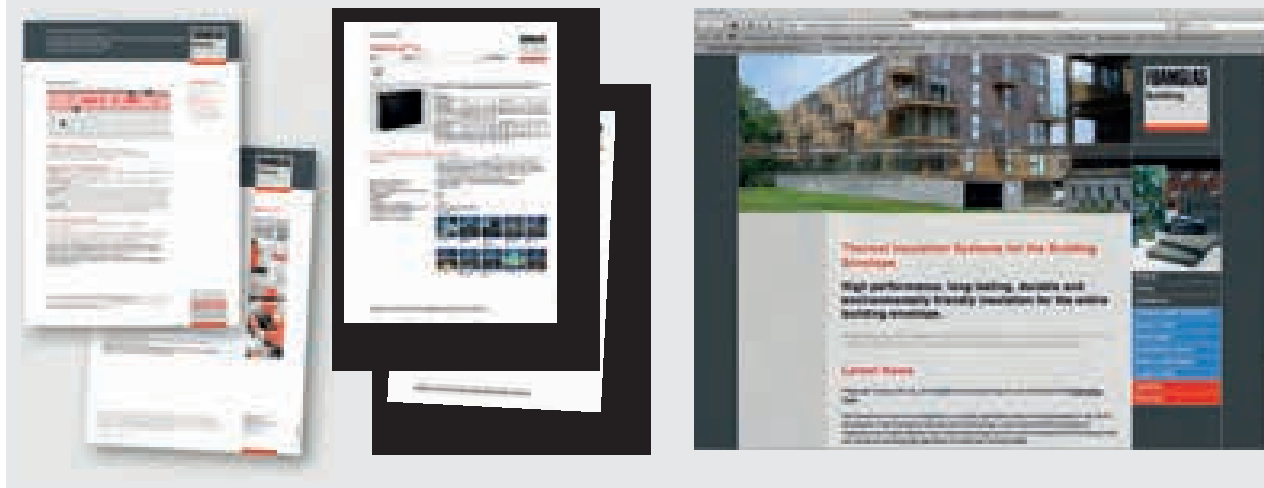
LOCAL COMMUNITY: MyPlace, Romford. Mayville Community Centre, London. Bernie Grant Centre, Tottenham.

LANDMARK BUILDINGS: Shard Tower, London. Spinnaker Tower - Portsmouth, Hampshire. Heron Tower, London. Lloyd's Building, London.

INTERNATIONAL PROJECTS: Specifications prepared by Pittsburgh Corning (UK) Ltd.: Qatar National Museum, Doha. Islamic Museum of Modern Art, Doha. Waterfront Centre, Festival City, Dubai. Carnegie Mellon University, Doha. Sheik Villa, Doha. Abu Dhabi Officers Club, Abu Dhabi. Dubai Mall, Dubai. Binzagr Office Building, Al Khobar. Al Khobar Airport, Al Khobar. Qatar Convention Centre and Tower, Doha. Texas A+M University, Doha. Princess Norah University, Riyadh. Clock Tower, Mecca. Arzanah Medical Complex, Abu Dhabi. Hamad International Airport (former New Doha International Airport), Doha. Voith Centre of Competence, Dubai. Phoenicia Intercontinental Hotel, Beirut. CMA Tower, Marseilles, France. Tietgens Ærgelse, Copenhagen, Denmark. Dresden Rail Station, Dresden.

Contact Information for UK Offices

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Pittsburgh Corning (UK) Ltd offer design professionals a range of technical services including, U values and condensation risk analysis, assistance with design details and specification writing. As manufacturers we believe CPD seminars play an important role in keeping Architects and Structural Engineers informed of product development and ever changing legislation.

We would welcome the opportunity to conduct our **RIBA Accredited CPD Seminar** at your premises; usually run over lunchtime period with buffet lunch provided, the central theme of the presentation will be:

BUILDING PHYSICS AND CELLULAR GLASS:

- Sustainability: Energy Savings and the Environment
- Eliminating Condensation Risk
- Reaction to Fire, Legislation (Reducing the Fire Load)
- Reducing Thermal Bridging
- Insulating for the Lifetime of the Build
- Proven Design Solutions
- Manufacturing Process (Ecology & Sustainability)
- Technical Support

Additionally there will be a choice of specialist focuses for the presentations including

Below Ground:

Basement structures, cellular glass insulation and waterproofing systems.

Terraces and Balconies:

Strength and stability for heavy foot traffic and load bearing roofs.

Façades:

How can cellular glass facilitate innovative design, reduce maintenance costs, and maintain a constant insulation for the life of the building.

High Risk Buildings:

Swimming pools and wet rooms; waterproof and impervious to water vapour, cellular glass protects the entire building envelope.

Standards and Regulations:

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